

THE RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer • TRANSPORT • The Railway News
The Railway Times • Herapath's Railway Journal • RAILWAY RECORD.
RAILWAYS ILLUSTRATED ESTABLISHED 1835 • THE RAILWAY OFFICIAL GAZETTE

PUBLISHED EVERY FRIDAY

AT

33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1

Telegraphic Address: "TRAZETTE PARL., LONDON"

Telephone No.: WHITEHALL 9233 (6 lines)

Annual subscription payable in advance and postage free:

British Isles and Abroad.....£2 5s. 0d.

Single Copies.....One Shilling

Registered at the General Post Office, London, as a Newspaper

VOL. 65. No. 18

FRIDAY, OCTOBER 30, 1936

CONTENTS

	PAGE
Editorials	683
Letters to the Editor	689
Publications Received	690
The Scrap Heap	692
Overseas Railway Affairs	693
British Railway Freight Traffic, 1929-1936	697
Ambergate—Where Four Routes Meet	698
C.P.R. Semi-streamlined Train	701
Colour Light Signals on the Swiss Railways	702
Door-to-Door Goods Wagons	703
New Steel Melting Furnaces at Crewe Works	704
Railway News Section	707
Personal	707
News Articles	711
Notes and News	716
Abstracts of Recent Patents	718
Contracts and Tenders	721
Official Notices	721
Railway Share Market	722

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

Steam Locomotive Development

SIR NIGEL GRESLEY'S presidential address to the Institution of Mechanical Engineers, summarised on another page, was of very special interest to railwaymen. From his account of the genesis of the Silver Jubilee train it becomes obvious that, after the submission by the makers of the Flying Hamburger of the proposition to adapt a larger unit of the same power, requiring a 4½-hour schedule, other considerations must have led to the final decision to adopt steam rather than diesel for the service. It is probable that the ability of existing standard steam equipment, with comparatively simple modification, to meet requirements, as well as questions of reliability and

maintenance—at that time less well answered than now—carried preponderating weight. Of great interest, too, were the figures, obtained from actual practice on the L.N.E.R., of the savings achieved by streamlining. These showed just what may be expected of streamlining for locomotives and in what circumstances such refinement is likely to be profitable. Probably the most important part of the presidential address was that which he reserved for brief reference towards the end. The significance of the statement that he was now very hopeful that a complete scheme to erect a locomotive testing plant in this country might soon materialise may be taken as an announcement that the long campaign for such a plant, of which Sir Nigel has been the chief protagonist, is nearing fruition. It might indeed seem extraordinary that the comparatively small sum of £150,000 should have been so long in the promise, were it not for the fact that even today the material questions of equipment, and even more so, of staffing such a plant have not reached such a degree of finality as most matters of engineering skill. To assure the utmost results from a modern locomotive testing plant it is essential that not only should the engineer in charge have the requisite mental equipment, but that his enthusiasm for the work should be such as to provide a reasonable guarantee that the knowledge gained from the experiments should be followed up with complete thoroughness. The selection of the staff of the new locomotive testing plant is a matter of supreme importance.

* * * *

The Week's Traffics

For the past week the traffic returns of the four group companies together show an increase of £97,000, compared with £125,000 for the previous week. Passenger train receipts again provide the largest gains, and coal earnings compare with a period when traffics of this class were heavy on fears of a coal strike in South Wales. The passenger train increases to date are:—L.M.S.R. £509,000, or 2.39 per cent.; L.N.E.R. £286,000, or 2.06 per cent.; Great Western £157,000, or 1.74 per cent.; and Southern £242,000, or 1.83 per cent. All four companies together show an aggregate total for the 43 weeks of £129,564,000, an increase of £4,228,000, or 3.37 per cent.

	43rd Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	%
L.M.S.R. ..	+ 21,000	+ 38,000	- 11,000	+ 48,000	+ 2,097,000	+ 4.16
L.N.E.R. ..	+ 10,000	—	- 1,000	+ 9,000	+ 1,227,000	+ 3.34
G.W.R. ..	+ 13,000	+ 5,000	—	+ 18,000	+ 569,000	+ 2.70
S.R. ..	+ 18,000	+ 4,000	—	+ 22,000	+ 335,000	+ 1.96

Mersey Railway traffics for the year to date show an advance of £2,175. The Belfast & County Down records up to October 23 an increase of £2,961, made up of £1,583 from passengers and £1,378 from goods.

* * * *

Railway Histories

Popular interest in our railways and their histories is a clear indication that rail transport still continues to occupy an exclusive niche in the affections of the travelling public. The cost of production of such historical works is necessarily so high that it is unlikely a commercial publisher would undertake to issue one at his own risk. It is therefore only with the backing of a railway company itself that such volumes may be expected to appear. Since the war, and until now, the G.W.R. is the only British main-line railway to have embarked on the venture, and the resulting very fine work of Mr. E. T. MacDermot is one for which all interested in railways are duly grateful. On

Monday the Southern Railway issued its own history (which we review on page 690), and thus within the past few years two notable railway histories have appeared from official sources. In pre-war years the outstanding history under official auspices was the late Mr. W. W. Tomlinson's monumental work on the North Eastern Railway, probably the finest railway history ever produced. Earlier still the Midland Railway was a favourite with historians, for, in addition to those by Williams and Stretton, there were many pamphlets on individual sections. Grinling's Great Northern and Steel's L.N.W.R. are among many others that come to mind, and amply demonstrate that popular interest is insatiable, and its gratification is limited only by sordid considerations of finance.

* * * *

Railway Preparations for the Coronation

Last week we referred to the arrangements being made by the L.N.E.R. to place 52 fully-equipped camping coaches at sites in the London suburban districts, where parties of six visitors travelling by L.N.E.R. to town may stay during Coronation week. The inclusive charge will cover travel between the suburban station and the London terminus for each member of the party daily for a week. Apart from this special facility, however, all the main-line railways are of course making widespread arrangements to cater for the heavy traffic expected. For Coronation Day (May 12) cheap tickets at approximately a single fare for the return journey will be issued to London from all stations where the train services will permit of both the outward and homeward journeys being accomplished on the same day, and these tickets will be available by any train both outward and return. For distances over 150 miles the outward journey may be begun from 9 p.m. the previous day. Cheap fare tickets at approximately the ordinary single fare for the return journey operating on early closing or regular cheap ticket days are also to be applied to Coronation Day and will be available by any train outward and return. During the period of the Coronation festivities, excursions will be run from various parts of the country and special facilities will be in operation for visitors to London, where extensive arrangements are also being made by London Transport for the London area.

* * * *

Six Months' Goods Train Traffics

With the Ministry of Transport statistics for the month of June, 1936, is given an analysis of the goods train traffics of all British standard-gauge railways for the 28 weeks ended July 11, 1936. In comparison with the corresponding period of 1935 there has been an expansion under all traffic headings, and it is noticeable that in merchandise tonnage and receipts and in live stock receipts the advance is in greater proportion in the last 16 weeks than in the first twelve weeks of the period. Higher class merchandise tonnage for the 28 weeks was 26,169,698, an increase of 1,355,100 tons, or 5.46 per cent., and receipts were £21,916,928, an increase of £777,209, or 3.68 per cent. For the 16 weeks the 14,989,160 tons showed an increase of 881,728 tons, or 6.25 per cent., and the receipts of £12,604,821 an increase of £461,013, or 3.80 per cent. Percentage increases in the 12 weeks were 4.42 in tonnage and 3.52 in receipts. In Classes 1-6 the expansion in the last 16 weeks was more remarkable. During the 28 weeks the tonnage carried was 29,368,761, an increase of 2,094,072 tons, or 7.68 per cent., and the receipts were £7,704,610, an increase of £521,316, or 7.26 per cent. In the last 16 weeks the tons carried were 17,168,292, an increase of 1,736,228 tons, or 11.25 per cent., with receipts of £4,533,872, which were higher by

£450,848, or 11.04 per cent. Coal traffic tonnage and receipts, however, expanded in lesser proportion in the 16 weeks period than in the 12 weeks. Live stock receipts for the 28 weeks were £666,913, an increase of £49,141, or 7.95 per cent.

* * * *

Meeting Exchange Loss on the B.A.G.S.

The lowering of working costs "through science and every other conceivable means" was stated by Sir Follett Holt in his speech at the Buenos Ayres Great Southern meeting last Wednesday to be one of the prime means by which loss on exchange could be offset. Had it not been for devaluation of the peso, even in the poor crop year under review the company could have not only met all preference charges, but have paid one per cent. on the ordinary stock as well. As our report on page 714 shows, considerable economy is looked for from extended use of diesel traction, particularly as oil supplies can be obtained from the field at Rivadavia which is held in shares with the Western and Pacific companies. Four more diesel locomotives and seventeen diesel passenger cars have been ordered and a further policy of adding to or replacing existing motive power with diesel units is envisaged. Among other measures may be mentioned the standardisation of stores and materials now in hand on the British railways in Argentina, which is facilitated for the Great Southern by the fact that the Superintendent in London of the Central Argentine Stores and Purchasing Department is now acting on the company's behalf.

* * * *

Railway Station Exhibitions

Londoners are by now well aware of the effective use of a portion of the Underground booking hall at Charing Cross for exhibitions of public interest. A great many displays have now been held there, of which probably the most picturesque was that which brought two cows in their stalls to chew the cud undisturbed by the hurrying humans around them. The latest of the series has been the Colonial Empire Exhibition initiated by our associated monthly contemporary *The Crown Colonist*, which we are naturally gratified to learn has proved to be one of the most successful ever held there, having been crowded every day of its three weeks' run. Our readers in the Colonies will also be glad to know that this exhibition, the first of its kind ever organised, has done much to dispel the ignorance of the Colonies which existed amongst the public at home. It occurs to us to wonder whether the enterprise and public spirit shown by the "Underground" and its successor, the London Passenger Transport Board, might not be worthy of imitation by the main-line railways in one or other of their London terminal or large provincial stations. Small-scale exhibitions of this kind evidently have a strong attraction for the public, and displays might be staged illustrating the amenities of British resorts, or perhaps the industries associated with the particular districts, or better still, some of the many sided activities of the railways themselves.

* * * *

Short Line Railroads in the United States

Since the passage of the U.S.A. Transportation Act of 1920, many schemes have been formulated for grouping the railways of the United States, and in every case the problem of the "short lines" has arisen. Outside America there are probably few who have a clear idea of what these railways are, and this is the more understandable when it is realised that the term "short line railroad" has no precise definition. It is therefore often difficult for the non-American railwayman to appreciate

the nature of the short line problem, although it has a well-recognised significance in the United States. Congressional committees have been told that the term means a railway that is "short in mileage or short in revenue or short in both," but, like most epigrams, this is not very helpful, and is in some respects misleading. Some railways are short in mileage but have very substantial revenues, while others with considerable mileage have very light revenues. There exists an American Short Line Railroad Association to protect the common interests of the undertakings in question, and Mr. Clarence A. Miller, the General Counsel of the association, in a recent article offered as a working definition that the short line railroad might generally be taken as one which was classified by the Interstate Commerce Commission as a Class II or Class III carrier; had a gross annual revenue of less than one million dollars; and was independently owned and operated. According to the latest figures there are between 500 and 550 such railways reporting to the Interstate Commerce Commission as being engaged in interstate commerce; they operate in total over 15,000 route miles.

* * * *

Air-conditioning and Hay Fever

New developments are invariably studied under a great disadvantage by the interested outsider. Researches and experiments ultimately lead to the production of valuable written records, but in the early days the people not immediately connected with the work in hand subsist largely on rumour. Air-conditioning is not so new that literature about it is lacking. On the contrary, there are weighty tomes on the subject. The lack of what might be termed a practical or easily understood handbook. Possibly the most valuable substitute for such a handbook is Circular No. 26 of the Illinois University Engineering Experiment Station. This is a collected edition of the papers presented at the first annual conference on air-conditioning. Besides containing all the facts hitherto obtainable from many scattered sources, or alternatively from proliferous works of great abstruseness, this collection contains new information regarding that very common scourge called hay fever. Rightly attributed in the past to pollen from grasses and other weeds, the complaint has nevertheless defied attempts to cure it. The control now exercised by air-conditioning engineers over the foreign matter content of air has enabled experiments to be performed showing just which pollens promote discomfort and the degree to which the air must be made free of them to relieve affected persons. Allowing for the fact that the conditions studied are American ones, we still think that the papers merit the closest study in this country and the colonies.

* * * *

Welding of Worn Crossings

Begun on main lines about seven years ago by the Southern Railway, the practice of building up worn crossings by welding has extended in this country to all the railways, although it is probably still most extensively used on the Southern. Electric-arc welding was long standard and is still by far the most prevalent method, but during the past few years oxy-acetylene welding has been adopted on an increasing scale. It was begun on the Stratford district of the L.N.E.R. 2½ years ago, and so successful were the results obtained that on that district it is now the standard method. The subject of re-surfacing worn crossings by oxy-acetylene welding was discussed at the recent conference reported in our last issue, when it transpired that this method was now being used more or less extensively by all the main line railways, the L.M.S.R. being the biggest user after the L.N.E.R. with a total of

over 80 crossings successfully welded to date. Figures quoted at the conference indicated that the oxy-acetylene method was slightly more expensive than electric-arc welding, but overhead charges, including depreciation were apparently not taken into consideration. Rivalry between electric and oxy-acetylene welding need not be a matter of much concern at a time like the present when the use of both forms of welding is expanding at an almost phenomenal rate.

* * * *

Welded Rails in Victoria

By June 30 last there was a total of 94 miles of track on the Victorian Railways laid with long welded rails. During the preceding twelve months eighteen miles of 110 lb. rails had been welded by the Thermit process, the standard welded length being 225 ft. In addition 5½ miles of 75 lb. rails welded into lengths of 103 ft. 4 in. and 11 miles of 80 lb. rails in lengths of 190 ft. were laid in country districts. The track through the Geelong tunnel was relaid with 110 lb. rails welded into a continuous length of 1,530 ft. As was recorded in our Overseas columns last week, the whole of the Newport—Geelong section is now to be relaid with 90 lb. rails welded into the standard 225 ft. lengths, and the released 80 lb. rails will be welded and re-used in the Toolamba—Echuca section. An automatic electric flash butt welding machine has been installed at the Spotswood depot for welding both new and serviceable rails up to 110 lb. section, and the cost of the welds by this process is claimed to be substantially lower than by the Thermit process. Incidentally, it would be useful if, in quoting costs of welds and similar items, it could be stated whether or not overhead charges, including interest and depreciation of plant, were included.

* * * *

Turbine Locomotives in the U.S.A.

Every year since 1928 the Committee on Steam Turbine and Condensing Locomotives, a subsidiary of the International Railway Fuel Association, has proposed and recommended a condensing steam turbine for use on locomotives, except in 1933, when it proposed a uniflow engine. This was because some manufacturers were very indifferent about developing designs for a direct geared transmission when this was proposed in place of an electrical system. However, in 1934 two large manufacturers, one of turbines and the other of gears, jointly designed a steam turbine, speed reduction and reversing gear with direct drive transmission. It was realised that this proposed change in design would materially increase the efficiency of the power plant and would also reduce the weight to about two-thirds of what would be required in a locomotive with electric transmission. Although the latter provides an exceptionally flexible drive and very high uniform torque at starting and low speeds, the efficiency is very low, ranging from about 50 per cent. to about 75 per cent. maximum. On the other hand the direct geared transmission also gives very flexible operation and a sufficiently high uniform starting torque, whilst the efficiency ranges from about 75 to 95 per cent. maximum. The committee in a recent statement sets forth its appreciation of the fact that through its nine long years of hard work it has stimulated sufficient interest in the steam turbine locomotive to bring it to the attention of the manufacturers and the railways, and through its efforts the first steam turbine powered locomotive will soon be built in the United States. The wheel arrangement will be 4-6-6-4, and the use of a high pressure boiler with oil for fuel instead of coal accords with the measures proposed by the same committee in its report for the year 1929.

Common User of Wagons

THE principle of the common user of certain types of wagon stock by the British railway companies has been in operation for nearly twenty years, and has enabled substantial operating and clerical economies to be achieved. As the result of the success which attended an experiment made during 1916 by the G.N.R. G.C.R., and G.E.R. Companies in the common user of ordinary open goods wagons, it was decided early in 1917 that the railway companies generally, subject to a few minor exceptions, should adopt the same principle in connection with all open goods, mineral, and coal wagons up to 12 tons capacity, except those of special types and those fitted with automatic vacuum or Westinghouse brake or pipe. Two years later the arrangement was extended to include covered vans up to 12 tons capacity, but again excluding special types and those fitted with automatic vacuum or Westinghouse brake or pipe. Owing to the constant cross-movements of wagons, it is obvious that unless special arrangements had been made, a forwarding company would quickly have become short of wagons under this arrangement, and a receiving company would have accumulated more than its quota of the common stock. In order to conserve for each company a supply of wagons equivalent to its contribution to the pool, therefore, the total exchanges of common user wagons between the companies at all points are balanced by the Railway Clearing House twice weekly; open and covered vehicles are recorded separately. Those companies which have received more wagons than they forwarded in the previous period are then called upon to repay the balance to the companies concerned within six days, failing which certain penalty charges become payable on each unbalanced wagon. This operation has characteristically been described in the American press as "maintaining a frozen per diem."

It will be readily appreciated that the operation of this principle means, in effect, that only unbalanced wagons have to be returned empty to the forwarding company, thus enabling a large reduction to be effected in the number of wagons which otherwise would have to be returned. In addition to the substantial savings in unremunerative empty wagon mileage, and the consequent higher percentage of loaded wagon-miles per train-mile which can be secured, a substantial economy is effected through the material reduction in shunting, increased user of wagons, and the reduction in exchange work at junctions, which, incidentally, facilitates the transit of traffic generally and reduces R.C.H. tracing and recording expenses. The common user of wagons also benefits traders who are able to load and forward any common user wagon embraced in the scheme in any direction, irrespective of the ownership of the wagon. The scheme has now been carried a stage further by the decision of the L.N.E.R., L.M.S.R., Southern Railway and the L.P.T.B. (Metropolitan Line) to bring into operation as from early in October the common user between themselves of the bulk of their vacuum-fitted open and covered vehicles of ordinary types. It will be observed that the Great Western Railway is not a party to this arrangement because, it is understood, all the company's vacuum-fitted open wagons and covered vans, amounting to a high percentage, are fitted with the Instanter coupling, whereas the vacuum-fitted stock of the other companies consists largely of screw-coupled vehicles. If the four main-line companies had agreed to put their vacuum-fitted stock into common user, each company concerned would receive a large number of vehicles fitted with couplings different from those ordinarily used on its system; the operating disadvantages involved were

evidently considered to outweigh the advantages of a complete common user. Nevertheless the modified scheme which is now operative will enable appreciable economies to be effected by the companies concerned.

* * * *

Buenos Ayres & Pacific Railway

CONTINUED improvement in the economic situation of Argentina was reflected in a general increase during the year ended June 30, 1936, in the principal items of this company's traffic, with the exception of fine cereals, of which there was a greatly reduced tonnage available. This was on account of the low carry-over from the previous year together with poor yields from the new harvest. Gross receipts improved by £289,310, or 4.64 per cent., but working expenses advanced by £508,450, or 10.89 per cent. This increase, however, includes £326,000 in respect of heavier expenditure on renewals and provision for deferred renewals, £168,700 caused by the refund of part of the salary retentions made during the previous year and payment of full salaries from February to June, 1936, inclusive, and the £13,750 extra cost of handling 334,100 tons of additional traffic. Net receipts were lower by £219,140, or 13.97 per cent. On exchange there was a net loss of £710,059, against £803,061 in the previous year, leaving a balance of £639,986, against £766,124. Adding £169,205 balance of interest, &c., gives a total of £809,191, which covers the year's interest on the first debenture stocks of the company and of the Argentine Great Western and the Villa Maria & Rufino Railway Companies, and all arrears of interest together with interest on such arrears have been paid on the second debenture stocks of the company and the Argentine Great Western Company. In addition, as already announced, a start has been made in reducing the arrears on the Pacific 4½ per cent. consolidated debenture stock, and the Great Western 5 per cent. debenture stock which have been outstanding since December, 1931, and March, 1932, respectively.

Road competition has continued to make inroads in the traffic of the railway, to offset which the company's activities in door-to-door transport have been extended, improved train services provided, and fares reduced within economic limits. Long distance traffic was much the same as in the previous year, and an additional £8,000 was earned by excursion trains. On the goods side there was an increase of £255,461, or 52.72 per cent., from maize, but other cereals brought in £160,789 less. The increase in maize was entirely due to the carry-over from the preceding harvest. Other cereals were affected by drought. Receipts from wine traffic were £1,746,647, an increase of £76,362, or 4.57 per cent. Higher purchasing power of the population and the measures taken by the Wine Controlling Board with regard to prices were the main causes of this increase. Goods receipts as a whole improved by £274,663, or 6.19 per cent. Some operating figures are compared in the accompanying table:—

	1935-36	1934-35
Passengers	11,320,627	12,163,202
Tons of goods (metric) ..	3,378,761	3,069,842
Train-miles	8,583,975	7,919,014
Net profit per train-mile ..	3s. 1½d.	3s. 11½d.
Operating ratio, per cent. ..	79.32	74.85
Passenger receipts	764,245	792,197
Goods receipts	4,714,873	4,440,210
Gross receipts	6,529,274	6,239,964
Working expenses	5,179,229	4,670,779
Net receipts	1,350,045	1,569,185

Early in the year the Government issued railway labour regulations carrying into effect the Presidential award, but certain classes refused to obey them. During the

month of June, partial stoppages followed by a general "go-slow" movement were initiated by men affiliated to the Union Ferroviaria. The local board after prolonged negotiations with the Minister of Public Works was successful in obtaining a decree ordering the union to normalise all services within 48 hours. This decree was accepted by the men and the services in all departments were quickly resumed. Since the beginning of the present financial year there has been an improvement in all traffics except fine cereals, fuel, building materials, and vegetables. Passenger traffic shows a slight advance and cattle traffic has increased 30 per cent.

* * * *

Buenos Ayres Western Railway

ON the operating side a slight improvement was shown by this company during the year ended June 30, 1936, as the gross receipts increased by £13,384, or 0.38 per cent., and in expenses there was a reduction of £3,386, or 0.11 per cent. The net loss on exchange was also lower by £36,788, and credits from investments, interest, &c., were higher by £14,793. The amount brought in from the previous year was, however, £112,740 lower, and prior charges, including a new contribution of £15,450 to claims reserve account, are £9,744 higher, so that the amount available for dividends is reduced by £54,133. The 1 per cent. dividend on the $\frac{1}{2}$ per cent. preference stock takes £25,523, as against the £57,427 required by the 2½ per cent. dividend paid a year ago, and the amount carried forward is reduced from £55,433 to £33,205.

With the directors' report are given extracts from the report of Mr. C. R. S. Harris, the Director General. These show that passenger traffic declined by about 3 per cent., the decrease being shared in about equal proportions by suburban and general bookings. Increasing road competition and reduced employment owing to the bad harvest were chiefly responsible for this decrease, but the traffic for the previous year was swollen by the Eucharistic Congress and the visit of the President of Brazil. To combat road competition on the suburban section new season ticket rates, and reduced single, daily return, and cheap day tickets have been introduced, which have given good results. Reduced fares have also been put in force on the Buenos Aires-Chivilcoy section and the validity of return tickets has been extended. The diesel-electric service which was first run to Bragado and later extended to C. Casares has been well received by the public. Notwithstanding the very poor harvest, due to prolonged drought during the winter months followed by unseasonable rains at the time of harvesting, receipts from goods fell only by £18,659, or 1.18 per cent. The decrease of £24,562 in the receipts from fine grains was to some extent compensated by the increase in maize—due entirely to the heavy carry-over from the previous year—and by an increase in fruit and vegetables traffics from the Colonia Alvear Zone. In live-stock receipts there was an increase of £32,388, or 4.09 per cent. Some comparative operating figures follow:—

	1935-36	1934-35
Passenger journeys	20,000,359	20,797,255
Tons of goods	1,974,453	2,067,184
Average haul, km.	218.71	215.71
Train-kilometres	8,830,337	8,792,905
Operating ratio, per cent. ..	83.52	83.94
Passenger receipts	746,694	770,033
Goods receipts	1,563,614	1,582,273
Gross receipts	3,526,587	3,513,204
Working expenses	2,945,534	2,948,921
Net receipts	581,053	564,283

During the year under review no effective deductions from wages were possible, the total retentions made under

the Presidential Award of 1934 being returned to the employees, whereas during the previous year the company was able to retain about 48 per cent. This fact accounts for the increase of £27,027 in traffic expenses, as well as for the comparatively small volume of savings effected in other departments. A saving of 3.39 per cent. in direct expenditure on maintenance of way and works was rendered possible by the introduction of fly packing and other improvements. Authorisation has been obtained for a programme of rolling stock conversions, the chief object of which is to enable economies to be made in train running. Further steps were taken during the year to co-ordinate the mechanical departments of the Southern and Western Railways. It has also been possible to effect a much closer degree of fusion in the accountant's department, and continuous efforts have been made to reduce establishments in all departments of the administration. To meet motor lorry competition the railway companies operating under federal jurisdiction have established a system of local tariffs ruling from stations situated up to 270 km. from Buenos Aires. The Western has also to meet the competition of the Buenos Aires Provincial Railway which has lower published rates and offers a big rebate on agreed tonnage as well as numerous other concessions through the medium of cartage companies.

* * * *

Sudan Railways

WADI HALFA, the northern terminus of the Sudan Railways, has no railway connection with Shellal, the southern terminus of the Egyptian State Railways, but communication between these points is provided by the Sudan Railways administration by means of boats on the Nile. The main railway system of 576 miles on the 3 ft. 6 in. gauge runs southwards from Wadi Halfa to Abu Hamed, Atbara, and Khartoum. A branch from Abu Hamed to Kareima serves the Dongola province, and there is railway communication from Atbara to Port Sudan on the Red Sea where a modern harbour has been constructed. South of Khartoum there are railways to Sennar, Kosti, and El Obeid, and at Sennar there is a connection with the railways to Gedaref and Kassala, which join the Port Sudan line at Haia. Steamers between Kareima and Kerma serve the Dongola reach of the Nile, and south of Khartoum there are river services in the direction of Uganda and the Belgian Congo. At the end of 1935 the route mileage of railway open was 2,021 miles on the 3 ft. 6 in. gauge, and the mileage of river services remained at 2,325. In addition the administration operates Port Sudan Harbour, power stations, hotels and catering services, and miscellaneous services.

All the services together brought in for 1935 a gross revenue of £E.2,511,827 and a net revenue of £E.1,195,194, which compare, respectively, with £E.2,161,811 and £E.895,992 for 1934. Profits from steamer services in 1935 amounted to £E.37,325, against £E.62,963 for 1934, from Port Sudan Harbour to £E.82,382 against £E.53,879, and from hotels and catering to £E.4,520 against £E.3,044. The advance in gross receipts is mainly due to additional revenue on account of the increased cotton crop, the greater movement of import traffic and in a smaller measure to the abnormal conditions prevailing during the latter part of the year. Passenger receipts both on rail and river were affected by a change in the charges for Government traffic. Up to the end of 1934 all Government passenger traffic was charged full fares, but it was decided that as from January 1, 1935, charges to Government should be made more in accordance with the principles of rating adopted in the case of public traffic. On the railways although the

number of passengers increased by 21·34 per cent., the receipts therefrom fell by 7·76 per cent. The numbers carried in all classes increased, with the most prominent advance in the fourth class—132,451, or 25·1 per cent. In goods traffic the exports of ginned and unginned cotton and cotton seeds amounted to 142,954 tons, against 86,344 tons in 1934, producing £E.380,101, against £E.237,306. Imports were again increased by items for the Gebel Aulia dam and were also influenced by the general prosperity. Rate adjustments gave a satisfactory increase in the local tonnage of gum, onions, dates, and piece goods. Large quantities of dura, flour, beans, benzine, &c., were forwarded to Kassala for Eritrea during the year. Figures in the accompanying table refer to railway services only:—

	1935	1934
Passengers	784,246	646,309
Goods tonnage	914,652	817,360
Train-kilometres	3,150,446	2,922,583
Operating ratio, per cent. ..	46·6	53·6
	£E.	£E.
Passenger receipts	206,122	223,464
Goods receipts	1,682,411	1,279,367
Total revenue	1,995,352	1,667,209
Working expenses	929,488	893,921
Net profit	1,065,864	773,288

Provision has been made for the replacement of certain obsolete engines by engines of a more powerful type, capable of running on both light and heavy tracks. The practice of running overlength trains on certain sections was maintained throughout the year with beneficial results in operating. In order to facilitate repair, by welding, of worn permanent way crossings, a Mawdsley petrol driven portable welder was purchased and proved a highly satisfactory unit. With an increase of 12·12 per cent. in revenue earnings tonnage, and 21·34 per cent. in passengers carried, there was only a 7·8 per cent. increase in productive train mileage.

* * *

London Transport Report

THE third annual report and accounts of the London Passenger Transport Board, covering the year ended June 30, 1936, appears like its predecessors in a handsome orange-red cover. It includes four maps—railway, bus, coach, and tram-trolleybus. During the year London Transport carried 3,648,000,000 passengers, and its trains, buses, trams, and coaches ran 546,692,000 miles. These figures surpass all previous records. The total number of journeys made per head of the population in the London Passenger Transport area during the three years of the existence of the board has grown from 430 in 1933-34 to 436 in 1934-35, and 440 in 1935-36. How the different methods of transport have been utilised will be seen in one of the accompanying tables. In the year under review the percentage of passengers using buses and coaches was 58, tram passengers were 27 per cent., railway passengers 13 per cent., and trolleybuses 2 per cent. In comparison with the previous year the changes in distribution are slight, but in connection with trolleybuses it should be noted that at the close of the financial year under review there were 61 miles of route equipped and operated, and 105 miles were in process of conversion, while powers have been obtained in the Act of 1936 to convert a further 51 miles of route.

Work has already commenced upon the extension of the Bakerloo Line to make connection with the Metropolitan Line at Finchley Road and upon the diversion of the Uxbridge Line to the new terminus in the High Street, Uxbridge. Work is also proceeding upon the reconstruction of the stations at Aldgate East, King's Cross, and Post Office. A new station has been built

and opened at Park Royal, taking the place of a temporary station. The new station is placed upon Western Avenue and is attracting a largely increased volume of traffic with the development of adjacent land. Surveying of routes and the preparation of contract drawings and specifications in connection with the north-eastern extension of the Central London tube line and the northerly extension of the Highgate tube line has proceeded during the year in collaboration with the London and North Eastern Railway Company. Work on these schemes will be begun this autumn. By the extension of certain trains running upon the Metropolitan Line beyond Aldgate to Barking, via Whitechapel, an additional service of 8 trains an hour is provided during peak periods to relieve the congestion upon the Barking Line. With regard to abatement of noise the board considers that it now has sufficient experience to justify the practical application of ameliorative measures on a reasonably large scale.

	1935-36	1934-35
	£	£
Passenger receipts originating on—		
Railways (L.P.T.B., G.W.R., L.M.S.R., L.N.E.R., S.R., and Joint Lines)	18,499,092	17,847,495
Buses and coaches (L.P.T.B.) ..	15,959,445	15,774,053
Trams (L.P.T.B.)	5,719,103	5,932,838
Trolleybuses (L.P.T.B.)	428,699	163,801
Total	40,606,339	39,718,187
Average receipt per passenger journey	2·312d.	2·308d.

Passenger journeys originating on L.P.T.B. system—		
Railways	467,869,687	445,888,289
Buses and coaches	2,127,498,934	2,094,764,436
Trams	983,012,848	1,013,433,692
Trolleybuses	69,581,164	28,262,013
Total	3,647,962,633	3,582,348,430
Originating on G.W.R., L.M.S.R., L.N.E.R., S.R., and Joint Lines	566,993,330	547,092,272
Grand Totals	4,214,955,963	4,129,440,702

The board's share of these receipts, after operation of the pooling scheme, amounted to £29,532,879 in 1935-36, against £28,823,262 in 1934-35, and £27,151,277 in 1933-34. To these sums have to be added goods and miscellaneous traffic receipts, and the general financial results of the board's operations are shown in the following table:—

	1935-36	1934-35
	£	£
Capital expenditure	118,088,715	113,152,136
Total traffic receipts	29,724,723	29,016,085
Working expenses	23,515,821	22,515,889
Provision for renewal	2,300,000	2,526,000
Net traffic receipts	3,908,902	3,974,196
Other receipts	1,563,214	1,500,014
Miscellaneous charges	298,077	347,939
Net revenue	5,174,039	5,126,271
Transfer from C stock interest fund	28,632	—
Interest on London Transport stocks		
other than C	4,080,447	4,076,675
C stock interest	1,027,952	1,015,192
Other appropriations	94,272	34,404

Amongst "other appropriations" in 1935-36 are included £30,639 to C stock interest fund, and £35,050 proportion of amount payable towards meeting interest on securities issued by London Electric Transport Finance Corporation Limited. The operating ratio for 1935-36 (excluding provision for renewal) is 79 per cent. as compared with 78 per cent. in the preceding year. The consideration for all the undertakings transferred to or acquired by the board under the Act of 1933 has now been ascertained. Up to June 30, 1936, the amount of London Transport stock issued was £111,933,867, an increase compared with the stock in issue at June 30, 1935, of £398,413, made up of £39,699 4½ per cent. A

stock, £39,699 5 per cent. B stock, and £319,015 C stock. These additions were made as consideration, or part consideration, for transferred undertakings.

In the accompanying table are shown the original standard, and the revised standard, proportions of the pool of passenger receipts which have been settled by the Standing Joint Committee of the board and the main line railways:—

	Original standard proportions	Revised standard proportions
	Per cent.	Per cent.
L.P.T.B.	62.00473	62.10364
G.W.R.	1.33541	1.33194
L.M.S.R.	5.09340	5.08014
L.N.E.R.	6.01488	5.99922
S.R.	25.55158	25.48506
Total main line railways	37.99527	37.89636

The revision was due to savings realised in the board's road mileage, and to changes in its working expenses consequent upon standardisation of wages and other costs of acquired road undertakings. The revised standard proportions remained unchanged during 1935-36.

* * * *

The Last of a Remarkable Signal Box

AFTER just over 44 years' service the large mechanical "A" signal box at Waterloo, Southern Railway, with others farther out, gave place on October 18 to an all-electric box of the latest type, thus completing the power and automatic signalling from the terminus to Hampton Court Junction, the greater part of which was described in our issue for May 29. The "A" box, on a bridge across the outgoing lines, was brought into use in three stages, beginning on May 1, 1892, and was justly regarded at the time as a remarkable piece of work. It

then had 236 levers, in two parallel rows, and included the Simplex lever-saving apparatus and a number of setting levers for special locking, thus doing work that would ordinarily have required 350 to 400 levers. Direct tappet locking in 131 troughs was used, the interlocking combinations being very intricate; Major Marindin was said to have spent three days in testing them. They were effected by means of special mechanisms designed by Mr. W. F. Burleigh, head of the technical department of the then well-known firm of Stevens & Sons, who is happily still with us. Signal wires were carried overhead, and the point rodding was arranged in double tier. Over the cabin was a lattice signal gantry carrying no fewer than 67 arms, long one of the railway sights of London. Lock-and-block instruments, electric selectors and reversers, fouling bars and other devices due to W. R. Sykes were largely used, and the platform inner homes were three-position signals, indicating "caution" if the far end of a road was occupied. The three-position platform home signals fulfilled the same function as the home-and-distant arrangement adopted by the L.B.S.C.R. at London Bridge and Brighton. Although there were several large signal boxes in London in 1892, the combination of electrical and mechanical devices peculiar to Waterloo "A" made it probably the most interesting of all. With the adoption of the Sykes block on the Great Eastern a few years later those at Liverpool Street assumed much the same character. An interesting description of the completed work was given by the late Mr. A. W. Szlumper in a paper to the Institution of Civil Engineers in 1892. From time to time many changes were, of course, made in the "A" box, as the layout was modified, and the array of arms above it gradually disappeared. Now the semaphore has gone from Waterloo, save as a shunt signal.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Beds in Sleeping Cars

London, October 23

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The beautiful coloured picture reproduced in the advertisement pages of your current issue of an L.N.E.R. sleeping compartment tempts me to point out a defect which is very common in sleeping cars but would be very easy to remedy. The picture shows that the bed has been made up by someone who is not destined to sleep in it, for the blanket protrudes beyond the upper sheet! The proper way is, of course, not to fold the blankets at the top, but to fold over them an allowance of sheet amply sufficient to protect the sleeper from direct contact with the blankets.

Travel by sleeping car in this country is so good that it is a pity it should be so often slightly marred by a badly made up bed.

Yours faithfully,
"NIGHT BIRD"

Train Ferry Connections to Brussels

56, St. Mary's Mansions,
Paddington, W.2.

October 17

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—At the conclusion of your article on the new Channel ferry service (page 627, October 16) you quote an arrival time at Brussels of 10.32. But the C.F.B. now run a bloc train at 7.52 a.m. from Lille, due at Brussels at 9.17, which connects with the service from Dunkerque, and returns from Brussels at 22.00, giving the ferry connection at Lille. These

bloc trains call only at Tournai, run at a similar speed to the Calais-Brussels Pullman (using, however, the Midi station at Brussels), and represent a considerable improvement on the cross-country service hitherto operating over this route. Like most of the new C.F.B. bloc trains, they are second and third class only, and a Nord locomotive works from Lille through to Brussels.

Yours, &c.,
R. E. CHARLEWOOD

Notable Emergency Runs

58, rue de Courcelles, Paris.

October 17

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—Since October 4 the 10.15 a.m. Paris-Lille train has been replaced by a 3-car diesel-electric unit, running via Longneau and covering the distance of 156 miles in 150 minutes, including two stops. The 78.3 miles from Paris to Longneau are run start-to-stop in 65 minutes. On October 4 the number of passengers exceeded the capacity of the 3-car unit and a steam train was run instead. The engine was No. 31194, one of the latest Chapelon (Paris-Orleans) type Pacifics, and the make-up was 6 cars, weighing 250 tons in all. Creil—31.3 miles—was passed in 26½ minutes and Longneau reached in 63½ minutes, with no higher speeds than 78.79 m.p.h., but with minimum speeds of 76 on Survilliers and Gannes banks, and a tremendous acceleration from the regular 56 m.p.h. slack at Creil. Lille was reached 1 minute ahead of time.

Yours truly,
EARON G. VUILLET

PUBLICATIONS RECEIVED

A History of the Southern Railway. Compiled from various sources by C. F. Dendy Marshall. London: The Southern Railway Company Publications Department, Victoria station, S.W.1. (Also obtainable through the bookstalls of W. H. Smith & Son.) 10 in. x 7 in. x 1½ in. 708 pp. + 4 coloured plates and 2 folding plans. Price 17s. 6d. net.—On Monday of this week the Southern Railway Company launched the historical volume dealing with its own activities and those of its constituent undertakings which has been eagerly awaited for the past two years. Although it is only during this period that the general public has been aware that the work was in course of preparation, the initial steps for its production were taken more than ten years ago. The Southern Railway is therefore to be congratulated, first of all for its early appreciation that grouping was bound to result in the loss of some of the individuality of the railways it absorbed, and that the more intimate touch of the smaller unit was a heritage well worthy of preservation, if only on paper.

The title page indicates that Mr. Dendy Marshall's responsibility is that of compiler and not author, and the prefatory note elaborates the point by stating that the material has been gathered from many sources, principally the records of the Southern Railway. Information was also supplied by the late Mr. H. Raynar Wilson (who first undertook the work of compilation, but subsequently relinquished it), Mr. G. A. Sekon (one-time Editor of *The Railway Magazine*, and author of short histories of the South Eastern Railway and the L.S.W.R.), and Mr. W. S. Palmer. This history therefore differs from all the other well-known railway histories in that its style and treatment are not those of one individual.

Even a cursory perusal shows that, as may be deduced from the total number of pages, this volume does not set out to give a complete history of all the undertakings now merged in the Southern Railway. The treatment is rather that of giving the story in broad outline, and elaborating but two aspects, namely, locomotives and signalling. In this the discerning reader will identify the interests of Messrs. Dendy Marshall and Raynar Wilson. Locomotives receive very generous treatment and we think with a correct appreciation of public taste, for the steam engine is well known to possess a peculiar fascination and to claim a greater number of enthusiastic adherents than any other feature of railway operation. Signalling also is not unhappily chosen, for various of the railways now merged in the Southern Railway have played no mean part in the development of signalling from its earliest days, and the record of the Southern Railway and its predecessors with regard to safety is one of which they may well be proud.

Every accident to a train in which a passenger's death has occurred has been chronicled in the pages of this volume, and a retrospect shows that in nearly 100 years there have been only 42, involving the loss of 177 lives other than those of the company's servants—about the average number killed every week on the roads of this country.

The work is divided into six parts. Part I, entitled "The Earliest Railways in the South of England," takes the story back to an earlier period than many realise that the Southern Railway can trace its descent. The Surrey Iron Railway was established by Parliament as long ago as 1801 and was the world's first public railway. Although a horse-traction line, this may be considered the earliest ancestor. Steam traction was first used in the South of England on the Canterbury & Whitstable Railway, but it is often overlooked that this was the first railway to convey passengers by means of a locomotive. For goods wagons the Stockton & Darlington Railway had used steam traction from its opening in 1825, but all its passenger coaches were drawn by horses until September 7, 1833. The little Canterbury & Whitstable line at its opening on May 3, 1830, was therefore a pioneer, for the larger and far more important Liverpool & Manchester Railway did not make its bow to the public until September 15, 1830. Other notable ancestors of the Southern Railway were the Bodmin & Wadebridge Railway, the first steam line in the West Country; the London & Greenwich, the earliest locomotive line to enter the Metropolis; and the London & Croydon Railway, the only Southern Railway constituent to have used atmospheric traction. Another important feature of these early days was the installation in 1843 by Charles Hutton Gregory of a frame at the junction of the Bricklayers' Arms branch which contained the germ of interlocking.

Parts II, III, and IV are devoted respectively to the London & South Western Railway, the London, Brighton & South Coast Railway, and the South Eastern & Chatham Railways. All had their peculiarities, and these are given preference over the routine of railway development, in accordance with the policy of providing a readable and interesting volume to tickle the palate rather than a comprehensive historical survey. These tit-bits are, however, given with considerable regard for accuracy, even at the risk of losing their more exciting "daily paper" features. Thus, the intended application to the Guildford Junction Railway (then an independent enterprise) of Prosser's patent guide-wheel arrangement is described and illustrated, but it is made clear that it was never adopted. The idea was to use wooden rails and rolling stock with flangeless wheels, both locomotives and carriages being equipped with double-flanged guide wheels set on

short axles at an angle of about 45 degrees and acting on the squared corners of the timber rails. In 1925, Sir John Aspinall quoted Prosser as having said the system was actually used on the Guildford and Woking line, so historians have reason to be grateful to Mr. Dendy Marshall for "laying the ghost" as satisfactorily as he does.

Another notable feature of this book is the fine collection of seals of old railway companies, many of them early and little known. The index reveals that there are nearly 60 of these, and we suppose that few of the passengers making up the enormous daily suburban traffic handled by "the world's greatest suburban electrification," will have realised before the production of this history, that the Bexley Heath, Bromley Direct, Charing Cross, Victoria Station & Pimlico, West End of London & Crystal Palace, West Wickham & Hayes, and Westerham Valley, were merely some of the many separate units that have been merged into the present system. Closely allied with seals are stamps, tickets, and passes, all of which are represented, although not in the full way adopted with seals. A novelty reproduced is a telegraph stamp issued by the South Eastern Railway. Prior to January, 1870, when the company's telegraphs were purchased by the Post Office for £200,000, stamps of very handsome design were issued for payment of telegrams sent by the public—an unique feature of railway practice. Surviving specimens are now of great rarity.

This is the first railway history to be brought up to the present time and to cover post-grouping details, for E. T. MacDermot's great work took the story of the G.W.R. only up to 1921, and thus ignored the grouping acquisitions in Wales and elsewhere. Part V of the volume now under review outlines briefly the story of the Southern Railway in two periods, namely, the first five years after grouping (1923-1927), and from 1928 to 1934. Even here the predominance of the steam locomotive is again evident, and the stranger reading the volume would scarcely gather from the brief textual references and one illustration what an important place electric traction occupies in the Southern Railway undertaking. Part VI is devoted to steamers and docks, and Part VII to the epilogue and appendices. The last-named are a useful reference feature, for, as in our own *G.W.R. Centenary Number*, they tabulate the chief administrators and officials with the dates they held office, and various statistical data. The whole volume is generously illustrated, but with a strong subject bias. There are four coloured plates covering five locomotives and a Navy Week poster. The first is one of a batch built in 1842 for the South Eastern Railway by Sharp, Roberts; the second and third each contain two L.B.S.C.R. engines; and the fourth is the poster. Readers are thus not given a sight of the liveries of any pre-grouping company except the L.B.S.C.R. Nor is any rolling stock

shown in colour; indeed rolling stock has failed to attract the compiler. As a pleasant and readable volume this may be cordially recommended, but the title must not be taken too literally, for the historian will deplore many omissions.

Hutchinson's Technical and Scientific Encyclopædia. Edited by C. F. Tweney and I. P. Shirshov. London: Hutchinson & Co. (Publishers) Ltd. Four volumes. 8½ in. × 7 in. Illustrated. Price: Four volumes, £5; separate volumes, 28s. each, net.—The complete set of four volumes of this work, the first of which was reviewed in our issue of March 8, 1935, has now been published. In our earlier review, we outlined the aims of the compilers, which may be briefly recapitulated as the presentation in a form suitable for rapid reference of the vast amount of specialised information to which access is becoming increasingly necessary for others than those directly engaged in technical pursuits. The work is a serious and successful attempt to make up-to-date scientific information generally available in a digestible form, without sacrifice of accuracy or thoroughness. There are copious and clear line drawings.

Some idea of the scope and topicality of the work may be gathered from the section on locomotives, which occupies over eight pages. Types selected for illustration are an L.M.S.R. Garratt, the L.N.E.R. 2-8-2 *Earl Marischal*, and a diesel-electric locomotive of the Belfast and County Down Railway. Readers seeking fuller information on diesel power are referred to the pages dealing with internal-combustion engines, and such cross-referencing is typical of the plan of the work. The separate alphabetical sections are restricted to a convenient length, but subjects may, if required, be more thoroughly pursued by consultation under a number of headings. Valve gears (including the Lentz and Caprotti systems), power reversing gears, superheating, feed water heating, and general instructional details find their place under "Locomotives"; a short but useful survey of electric traction, with notes on locomotive transmission systems, concludes this section.

Regulated Sorbitic Bessemer Acid Steel Rails.—The quest for a railway rail of better wearing quality constantly occupies the attention of the railway engineer and of the rail manufacturer, and one of the avenues which has been explored in the course of this search has logically been that of heat treatment. In the development of the technique of heat treatment Messrs. Sandberg, the well-known consulting and inspecting engineers have played a leading part, and the Workington Iron & Steel branch of the United Steel Companies, which to date has produced by far the largest tonnage of Sandberg regulated sorbitic rails, can claim to have had, in this particular form of heat treatment, the widest experience. A book upon the subject

which has recently been produced by the latter firm, is therefore of the greatest value; and its interest is enhanced by the way in which its compilers have illustratively combined the spectacular aspects of steelmaking with technical descriptions and data concerning the manufacture and treatment of the rails in a book that is a model of its kind.

The Workington branch of the United Steel Companies is the only steelworks in this country which produces rail steel by the Bessemer acid process, and although it is improbable that universal agreement will be obtained to the makers' proposition that acid Bessemer steel, made to present B.E.S.A. composition limits, has better strength and wearing properties than basic open-hearth steel (the wearing capacity of the old Midland rails cited in this booklet would be claimed by many authorities as due more to their high manganese content than to their Bessemer acid quality), yet the essential purity of the acid product is not to be denied, and a rail of a very reliable quality may thus be depended on.

This purity is a valuable asset in the application of the regulated sorbitic treatment, as is also the makers' insistence on working to the maximum permissible limits of manganese, so that the treatment can safely be carried to a high degree of combined hardness and toughness in the head of the rail without fear of brittleness. In the booklet the whole course of the sorbitic treatment is described in detail and illustrated, as well as the subsequent retarded cooling, whereby internal strains in the steel are relieved, and the danger of transverse fissuring is obviated.

Particulars of tests follow, with figures relating to chemical composition, tensile and hardness tests, falling weight tests, and crossed prism tests, wherein the physical properties of the untreated and treated steels are compared. Attention is then devoted to wear results, particularly in the electrified tracks of the Southern Railway, which to date has been by far the most extensive user of regulated sorbitic Bessemer acid rails of Workington manufacture. As a work of reference, this little text book is well worthy of a place on the railway engineer's bookshelf.

E.S.C. Small Tools.—Under this title, the English Steel Corporation Limited has issued a catalogue, bound in stiff boards, forming a complete compendium of the small tools manufactured at the company's Openshaw and Sheffield works. This supersedes the sectional booklets previously issued, and is intended not only to facilitate the ordering of tools, but also to provide a handy book of reference. It illustrates the many improvements in design and quality which have been made during the past few years in E.S.C. small tools, and in its 238 pages covers a very wide range of products coming under this category. The catalogue is

designed to enable those consulting it to find immediately any tool they may require. By means of the thumb index at the front the page number of the section required is at once found, and there is an eight-page general index at the back of the book supplemented by a sectional index on pages 157-158, the latter pertaining to a section on files and rasps. A highly surfaced paper is used, and both text and illustrations are abundantly clear in all cases.

The Euston Record.—We have received from the Euston branch of the Railway Clerks' Association a copy of the first (October) issue of a four-page pamphlet entitled *The Euston Record*, which is intended to provide members of the branch with a localised survey of activities supplementary to the general news furnished by the *Railway Service Journal*. In addition to such material, the first number includes an article on personalities at the Euston branch headquarters, illustrated with some amusing cartoons. The paper should prove useful both as a record of achievement and a reminder of forthcoming events.

Winter Resorts. Great Western Railway Company, Paddington station, W.2. 8½ in. × 5½ in. 88 pp. Fully illustrated. Paper covers. Gratis.—Some of the milder complaints mentioned in the "Climatic and Medical" section of this illustrated guide might be almost tolerable if they served as an excuse for seeking the localities described in the opening pages. We feel, however, that without exposing ourselves to such discomforts, or incurring a charge of malingering, we can honestly number ourselves among those persons "who cannot tolerate the abrupt changes of the British inland climate," and thereby qualify for a mid-winter sojourn at one of the Cornish Riviera resorts. The descriptive matter is as good as a gallery of pictures in itself, but all the same we are glad the compilers have included such an array of attractive illustrations. A map of the G.W.R. and an alphabetical hotel guide are useful features.

Electric Furnaces.—Two illustrated leaflets have reached us from Metaelectric Furnaces Limited, Cornwall Road, Smethwick, Birmingham, dealing respectively with standard portable and special high temperature furnaces. The portable furnaces are for general heat treatment up to 980° C., and are designed and equipped to ensure uniform heating, high efficiency, and minimum power consumption. Uniform heat distribution has also been specially studied in the Circle range of high temperature furnaces, designed for the heat treatment of high-speed tool steels. The single chamber hardening furnace has a temperature range of 1,100 to 1,350° C., while the double-deck furnace has in addition a preheating chamber suitable for temperatures of 800-900° C. Silicon carbide heating elements of special design are fitted, provided with air-cooled terminals.

THE SCRAP HEAP

"England should have a Blue Train," says a writer. How about the 8.30 to town on Monday morning?

The *Glasgow Herald* for October 15 quoted from its issue of 100 years ago: "Mr. Lumsden, Treasurer to the Glasgow Royal Infirmary, has received the following, viz.: From Mr. Wm. Dodds, 15s., being a fine recovered for trespassing on the Ballochney Railroad . . ."

Recently, Mr. J. C. Webber, station-master at the Canadian National Bonaventure station, Montreal, found that a little bird had taken refuge in the skylight of the station concourse. Realising its perilous position, Mr. Webber secured a ladder and with a butterfly net caught the bird, which was given its liberty. "It's my experience that very often in bad weather little birds take refuge in the station," stated Mr. Webber, "and I have found a long-handled net very handy to catch them."

A City man rang up the *Evening News* recently to record his gratitude for the efficiency of the servants of London Transport. On the previous night the City man had dashed down the stairs at Preston Road, Metropolitan Line, station just as a train was running in. He looked at the clock. It was 8.16. "Must be the 8.17 to Uxbridge, running a trifle early," he thought. "Uxbridge?" he called to the porter on the platform. He thought the porter said "Yes," and boarded the train. At the next station—Northwick Park—a porter opened the compartment door. "A gentleman here for Uxbridge?" he queried. "Yes, why?" asked the City man. "This train is going to Watford," replied the porter. The porter at Preston Road, realising that the City man was in the wrong train, had phoned to Northwick Park: "Man in last compartment of first coach of Watford train wants to go to Uxbridge."

The locomotive steam engine, *George Washington*, made for the State of Pennsylvania, by William Norris of Philadelphia, was placed on the Columbia and Philadelphia railroad on Saturday afternoon, July 9. On the following morning her powers were tested, in ascending the inclined plane near Philadelphia. This plane is 2,800 ft. in length, with an ascent, in that distance, of 196 ft., being at the rate of 369 ft. the mile, or 7 ft. rise in 100 ft., or one foot in thirteen. The weight of the engine is 14,930 lb. only. The load attached weighed 19,200 lb., including the weight of twenty-four persons, who were on the tender and burthen car. The engine started immediately at the base, without a running start, and dragged up the said load of

We are indebted to Mr. R. D. Walker, Manager and Chief Engineer, Kowloon-Canton Railway, British Section, for sending us a copy of this advertisement, recently inserted by the railway in the local Hong Kong papers. The advertisement was withdrawn in two days, the reason being that many Chinese identified the figure as "Death" (Father Time has no significance for them). Mr. Walker adds that the motif might be used in England where no such significance or superstition would be attached.

19,200 lb., the above distance of 2,800 ft., in the space of two minutes and one second, or at the rate of 14½ miles an hour; pressure on the boiler, a fraction under 60 lb. to the square inch. The engine then descended the plane with the same load, at various speeds, frequently stopping to test the security. The valves being reversed, or set for going ahead, and when it was desired to stop altogether, the steam was let on very slowly, which brought her to a dead stand for a second or two, when she would immediately start up the grade. In this way, stopping and starting at pleasure, the time occupied in descending the 2,800 ft. was from twelve to fifteen minutes, thus testing the perfect security of her performance on the plane. She again ascended the plane, with the same load, and took her place on the road the same morning, ready for use.—From the "*American Railroad Journal*," July 16, 1836.

AMERICAN RAILWAY TRAVEL IN 1865

A correspondent in *The Times* of September 2, 1865, gave the following graphic description of the state of the American railways of that period, which, it will be recalled, was just after the war between North and South:—

A few illustrations of the excessive discomfort and danger of railway travelling in the United States may not be uninteresting. The total disregard to human life shown here since the war is most extraordinary. Coroner's juries sit to inquire into railway accidents, but will scarcely condescend to receive evidence. The permanent way on nearly every line

out of New York is now in a condition which must render disasters not a matter of chance, but of certainty. The rails are broken, and the sleepers are so rotten that they yield to every thrust of a walking stick. The cars oscillate wildly from side to side, and jump at a rate which prove it is not so easy a thing as it looks to cause a railway accident. The country roads across the line are not fenced in, and the level crossings have no gates to them, but merely a notice put up in these words, "Railway crossing, look out for the cars." This board is of no use after dark. In short, the least disagreeable accident that can happen to a railway traveller is to take away with him very unpleasant mementoes of his journey. All classes are huddled together in a long car—for all men are equal—and the atmosphere is loathsome beyond description. . . . Every now and then the guard walks through the cars, and does not ask the tourist for his ticket, but knocks him in the side if his head happens to be turned the other way, or pinches his arm. This, so far as I have seen, is invariable; the guard never speaks, but always uses his fist.

A large market for paint is provided by the railways. It is well known that the main-line companies in this country have relaxed their policy of rigid economy and have undertaken large-scale renovations of their rolling stock. This process is only in its early stages and for years to come paint companies should find profitable business in this sphere.—From the "*Financial Times*" of September 14.



OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

NEW ZEALAND

Higher Traffic Returns

From April 1 to July 18 the N.Z.G.R. total revenue amounted to £2,233,523, or £243,352 more than in the same period of last year, although this period in the present accounting year was three days shorter than last year. Meanwhile expenditure increased by £167,397, leaving an improvement in net revenue of £62,000, after allowing for the restoration of all cuts in salaries and wages. Every class of traffic shows an upward tendency at present, and there is definite evidence that the railways are likely to handle during the present year a considerably increased volume of both passenger and goods traffic.

Governor-General's Personal Interest in Railways

The Governor-General, Lord Galway, following up the constant interest he has shown in the Government Railways, recently visited the Hutt Valley workshops, accompanied by Lady Galway, the Hon. D. G. Sullivan, Minister of Railways, and Mr. G. H. Mackley, General Manager. The journey to and from the workshops was made by railcar. Their Excellencies expressing appreciation of the ease and comfort, and general excellence of the finish and equipment of the vehicle in which they travelled.

A complete inspection of the workshops was made, and Their Excellencies were impressed by the extent of the shops and the wide range of activities carried out there. They were also interested in the social aspects of the works, including the ambulance division, dining-rooms, and the general amenities of workshop practice in which these railway workshops are very advanced. They later made a trip by railcar over the Rimutaka incline, and are understood to have greatly appreciated this also.

Railcars on the Rimutaka Section

From September 7 there will be a marked improvement in the timetable covering the Wairarapa district, thanks to the introduction of the three railcars, *Maahunui*, *Mahuhu*, and *Mamari*, which are to supplement and partly replace the existing steam trains. A still more ample timetable will be provided when the full quota of railcars of the "Rimutaka" type has been completed at the Hutt Valley workshops. Not only will the introduction of these cars make for more speedy transport in the Wairarapa than has been possible by steam trains, but new opportunities will be available for travel to and from that area.

Seats may be reserved in the railcars, and intending passengers are re-

commended to make use of this facility in order to ensure accommodation by the particular service they contemplate. Ordinary second class fares will be charged, plus the reservation fee. The Railway Department has arranged to have a bus feeder service running between the Masterton township and the railway station there, for the convenience of all passengers by railcar and train.

Railcar Brakes

Because of the 1 in 14 grade on the Rimutaka Incline, special attention has been paid to the braking system on this type of car. The standard Westinghouse air brake system, with which the cars are equipped, is controlled by a constant lap valve in the driver's cab. It operates on the drum brakes of the leading bogie as well as on the rear or driving wheels. A centre-rail grip brake is also provided for use on the incline. This is a hydraulic-pressure brake in which a pressure of 2,500 lb. per sq. in. is applied through cylinders to a pair of cast-iron brake-shoes fitted with vertical arms. These brake-shoes grip each side of the centre rail with equal pressure. This powerful brake was tested for efficiency at the Hutt Valley workshops at a pressure exceeding 8,000 lb. per sq. in. Each set of wheels is equipped with sanding apparatus, supplied by the Westinghouse Brake Company, and the car carries 4 cwt. of sifted dry sand.

New Carriages

Fifteen new carriages—four first class and eleven second class—embodying all the latest principles of construction, will shortly be running on the South Island lines. They have the new "bucket" type of seat, making for a higher degree of comfort, the seats being in pairs and reversible on a centre pivot. In these carriages, which were constructed at the Addington workshops, all the fittings are designed to secure the maximum convenience for passengers, and a new feature is a panel that can be let down from the seat immediately in front to serve a variety of purposes. The general design of the new type of carriage may be described as semi-streamlined, and the roof is copper sheathed and finished with aluminium paint.

Wages Costs

According to a reply given by the Minister of Railways in the House of Representatives, the cost of the application of the 40-hr. week to railway employees this year would amount to £289,000, and the restoration of wage cuts would cost a further £197,000. There would, however, be no necessity to increase rates or fares. After legal advice had been taken it was decided that the former members of the Rail-

ways Board were not entitled to any compensation when their services were dispensed with after the passing of the Railways Amendment Act earlier this year.

UNITED STATES

Rock Island Streamlined Trains

The Chicago, Rock Island & Pacific Railway intends to place orders for six light-weight, streamlined trains of three or four cars each, to make possible the following high-speed passenger services between Chicago and Peoria (161 miles in 2 hr. 45 min.); Chicago and Des Moines (358 miles, in 6 hr.); Kansas City to St. Paul and Minneapolis (493 miles, in 8 hr.); and Kansas City and Denver (636 miles, in 11 or 12 hr.). No decision has been reached as to whether the motive power used will be steam or diesel-electric, or whether the cars will be built of light steel or aluminium alloy.

The Rock Island is in bankruptcy, and quite recently was not earning enough to cover even its operating expenses and taxes. That it is now in a position to spend £450,000 for such improvement to its service indicates the extent of improvement that has occurred in the railway situation; as well as the definite recognition now accorded to these novel trains by the public and by railroad managements.

Steam Railcars on the New Haven System

The New Haven Railroad has recently completed in its own workshops a two-car streamlined train, powered by a built-in Besler steam engine, of the flash boiler type. Twenty or twenty-five years ago there were a number of steam-driven railcars in service in the United States, but none since. With a new design of engine, steam once more is making a bid for a share in railcar and light train working.

New Locomotives for Pacific Coast Services

The Atchison, Topeka & Santa Fe, which is using a diesel-electric locomotive on its once-a-week, high-speed Super Chief limited train between Chicago and Los Angeles, now proposes to try the latest designs of steam locomotive in this exacting service, and has ordered from the Baldwin Locomotive Works two experimental streamlined steam locomotives, one a 4-6-4 and the other the 4-8-4 type.

Burlington to Demonstrate Reserve Power on its Zephyrs

The Chicago, Burlington & Quincy will inaugurate its new Zephyr train service between Chicago and Denver on a schedule of 16 hr. for the 1,034 miles on October 24. On the preceding day, a party of Chicagoans will be taken to Denver on one of the trains as a part of the festivities celebrating the occasion, and this special train is scheduled to make the journey in

13 hr., at an average speed of 79.2 m.p.h., and 3 hours faster than the regular schedule. [Cablegrams state that this journey was actually accomplished in 12 hr. 12 min., at an average speed of over 84 m.p.h.—ED. R.G.]

Popularity Test for Whistles

Indicative of the zeal and ingenuity with which the American railways are now striving to win public interest and favour is the recent popularity test conducted by the Florida East Coast Railway to determine public preference in its locomotive whistles. An engine was equipped with six whistles, each sounding a different note; and it was sent to principal communities on the line where committees of citizens were invited to attend an audition, and then to express their preference. Three of the whistles were operated by steam and the other three by compressed air. The vast majority of the hearers voted in favour of the deep-throated fog-horn tone of one of the steam whistles, which differs decidedly from that now in use on this railway.

Traffic Rise Continues

Railway gross receipts in August totalled £70,117,000, an increase of £11,319,000 over August, 1935. Net railway operating income (after taxes but before interest on bonded debt) for the month totalled £12,936,000, an increase of £4,505,000. For the eight months, gross receipts totalled £514,651,000, an increase of £54,000,000, and net railway operating income was £72,939,000, an increase of £20,160,000.

For the week ended September 26, freight car loadings totalled 807,000, the first time since 1930 that a total so high has been attained, and an increase of 28 per cent. over the corresponding week in 1935. Meantime, the "shippers' advisory boards" (committees of traders who consult regularly with the railways) have estimated that car loadings for the fourth quarter of the current year will exceed those of 1935 by almost 10 per cent.

Surplus Accumulation Penalised

The recent session of Congress enacted a corporation tax law which, if it remains on the statute book, will have an important effect on the capital structures of the railways. This law imposes punitive taxation on corporate earnings which are withheld from distribution to shareholders, reaching a maximum of 27 per cent. of net earnings in any year when these are used exclusively to pay debts, or improve plant or are otherwise withheld from the shareholders. Heretofore most improvements to railway plant have been made "out of earnings," and credited to the surplus account, sometimes being thereafter capitalised and sometimes not. But, under the new tax law, such investment of earnings will have to be immediately capitalised or be subject to penalty taxation.

The Chesapeake & Ohio is the first railway to take action which will enable it to continue improvement to its pro-

perty, while avoiding tax penalties. A meeting has been called for early in November at which time the shareholders will be asked to authorise the issuance of preferable stock to be distributed to shareholders as a dividend. This distribution, together with regular dividends in cash, will be sufficient to account for all the company's net earnings during the year. Thus improvement of the property can continue, but the amassing of corporate surpluses to enable companies in future to pay dividends in bad times (as the Chesapeake & Ohio has done throughout this depression) is precluded.

CANADA

New N. Quebec Mineral Line

A new branch line from Senneterre, on the C.N.R. transcontinental line, running southwards to the Perron, Bussieres, Greene-Stabell and Shawkey mining area, and thence westwards via the Canadian-Malartic, O'Brien, Thompson-Cadillac and McWatters mines to Noranda Rouyn, has now been surveyed, and it is expected that construction work will begin very shortly. This line together with the Taschereau — Rouyn branch forms a loop serving the whole of this mining district in Northern Quebec, and will open up and develop much new country, valuable in both minerals and timber. The length of the line now to be undertaken is 100½ miles. The National system has been the pioneer in opening up this, the Abitibi region, first by the construction of the trans-continental line and then with branches, and, though these parts of Northern Quebec and Northern Ontario were undeveloped prior to the coming of the railway, they are now proving to be highly mineralised.

ERITREA

Massawa-Asmara Cableway

This cableway, 74.5 km. in length, will, it is believed, be the longest in the world, and is expected to be in operation by next February. It is a three-rope installation, with two 30-mm. cables and a third 22 mm. in diameter. Long spans of cable have been necessary to cross some of the great valleys.

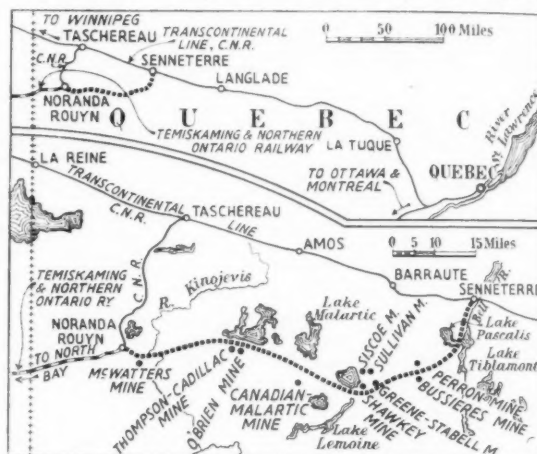
The cableway climbs to a height of over 7,000 ft. and is designed to carry a traffic equivalent to that of thirty railway trains between Massawa and

Asmara, spread over a twenty-hour period daily. In one hour 1,600 suspended buckets spaced at a distance of 100 m. apart are dealt with, travelling at a speed of 2.75 metres a second. Each wagon has a capacity of 300 kg. Goods rates will be much lower than by rail or road.

AUSTRALIA

Trans-Australian New Locomotives

As foreshadowed in these columns on June 12, the new express locomotives for the Trans-Australian service between Port Augusta and Kalgoorlie are now being constructed by Walkers Limited in Queensland, to the order of the Commonwealth Railways Commissioner. The special feature of these locomotives will be the tenders, which will have the largest capacity of any in Australia. They will carry 17½



Sketch map showing proposed C.N.R. branch line from Senneterre to Noranda Rouyn through rich mining area

tons of coal, sufficient for a 560-mile run, and 12,000 gal. of water, permitting of runs between watering stations up to 200 miles in length.

The principal dimensions of these engines, which are similar in design to the "C 36" type used on the New South Wales Government Railways, are as follow: tractive effort at 85 per cent. boiler pressure, 30,500 lb.; cylinders 23 in. x 26 in.; coupled wheels, diam. 5 ft. 9 in.; grate area 30.5 sq. ft.; total heating surface 2,640 sq. ft.; boiler pressure, 180 lb. per sq. in., total weight of engine, 86 tons, or with tender, 159 tons. These engines, which are of the 4-6-0 wheel arrangement, are designed to haul loads up to 460 tons at express speeds.

It is notable that the brake vans used on this trans-continental journey provide not only the usual accommodation for luggage, parcels and for the guard, but are also equipped with living accommodation for 10 dining and sleeping car staff. They are 60 ft. in length and 10 ft. 4 in. in width. [Air con-

ditioned rolling stock for this service was illustrated and described in our issue of September 4 last.—Ed. R.G.] With the new engines and rolling stock, this long journey across the desert should be made much more pleasant and will be considerably curtailed. It is expected that the accelerated services will be introduced in July, 1937, when the 84-mile Port Augusta—Redhill section has been built. It may be remembered that this new section of line, as well as reducing the distance of the overland journey by 70 miles, will eliminate two breaks of gauge.

SPAIN

War-time Railway Conditions

In Barcelona and other cities still occupied by the Government forces, armed men in blue overalls now occupy the sumptuous and tastefully furnished offices of the railway companies. Some of the former directors have, however, been retained in an advisory capacity but without any authoritative power. The M.Z.A. and Norte systems are still run independently of one another, although both are dictated to by the various political parties. Each has an administrative committee that works in conjunction with a confusing number of other committees, sub-committees and sub-sub-committees. These committees, composed of men with very little administrative experience, deserve credit for the work they are doing, for despite an ever-decreasing number of employees—large numbers have enlisted in the fighting forces—and lack of essential materials, every effort is being made to keep the railways up to pre-war standard.

Train Services in Catalonia

Services in Catalonia, including those to and from the French frontier, are keeping as far as possible to the old schedules. The M.Z.A. main line to Madrid is cut at Quinto, some miles from Zaragoza and service is maintained as far as Puebla. The Norte main line to Zaragoza and Huesca—both these towns are in the hands of the Nationalists—is used only as far as Tardienta. The Norte line from Valencia to Burgos is cut some distance from Teruel, also held by the Nationalists. A through service from Barcelona to Madrid via Valencia has, up to the time of writing, been maintained by the M.Z.A., trains going over Norte permanent way between Tarragona and Encina. The journey takes just over 24 hr.

War Traffic in Catalonia

It is hard to assess the magnitude of the work being performed by the Government-controlled railways in furnishing essential transport to and from the various fronts. Practically all troops and materials of war going from Barcelona to the different war zones are carried by railway. Special troop trains composed of ordinary third class carriages are run whenever needed,

though normally contingents going to the front use the regular services. No free tickets are issued, but passes are given to soldiers at various military headquarters, these being collected by the company and submitted at regular intervals for payment.

Congestion in the war zone is considerable, due mainly to the fact that most of the Spanish main lines are single track. Passengers travelling in these zones are subject to a good deal of discomfort. For instance a journey from Barbastro, near Huesca, to Barcelona, a distance of about 140 miles, takes some 9 hr. by the only train leaving at 6 a.m., three changes and frequent halts at wayside stations being necessary for officials to inspect passengers' documents.

Diesel Railcar Travelling Clinic

Many third class coaches have been converted into ambulances and a four-wheeled diesel railcar has been turned into a travelling clinic, with a completely equipped surgery and X-ray apparatus; there are also bunks for a few wounded. Several armoured trains have been turned out of various railway workshops. The armoured consists of welded $\frac{1}{2}$ -in. plating, sometimes in two thicknesses. Many passenger vehicles are used for propaganda and recruiting work and carry posters and signs calling the proletariat to arms. Nearly all locomotives bear signs and insignia of some kind.

Through Running in the Nationalists' Territory

On the other hand through trains with International Sleeping Car Company's cars are working through from Irun, on the French frontier, over the Norte main line to Burgos and thence via Salamanca right down to Seville, through the Nationalists' territory.

Moratorium Extended to Bond Interest

The Madrid *Gazette* of September 20 published a Decree extending the moratorium of July 19 to the payment of dividends and interest on the debentures of companies whose undertakings have been taken over by the State. The Decree comes into force as from the date of its publication in the *Gazette*. This is evidently an attempt to legalise the financial position of some of the companies, and is especially interesting to the railway companies. It does not, however, seem to meet the case of undertakings that have been seized or taken over by "workers' committees" with or without the connivance of the authorities, but for which seizure there is no legal warrant. The seizure of the principal railways was recognised and even justified by the Government in a Decree of August 3, but there are other smaller companies and undertakings which have been seized by the workers committees on their own responsibility, and the legal position of these must remain obscure; nor is it cleared up by the new measure.

CHINA

Chengtzu-Chungking Railway

The proposed route for this line has been altered and it is now the intention to run the line from Chungking via Kiangtsin, Yungchun (Yunchwan), Tachu (Tatsu), Neikiang, Tsechung (Tzechow), and Chienyang (Kienchow Nau) to Chengtu.

A New East-West Route

A new east-to-west railway is now proposed to connect Sinyang (on the Peiping-Hankow Railway) with Hofei (on the Hwainan line) and Wuyi (on the Tientsin-Pukow Railway) just north of Pukow, and arrangements are already being made for the construction of the western section of this line from Sinyang to Yehechiachi (Yehkiatsi) on the Honan-Anhwei border. It will be undertaken by the Honan Provincial Government, and the estimated cost is \$11,000,000. The approval of the Executive Yuan is asked for the issue of bonds to the value of \$20,000,000. The purpose of the railway is to assist and encourage the development of the country in the Yangtze and Hwai river valleys and it will be of considerable assistance in the suppression of bandit activities in the area, and along the Honan-Hupeh-Anhwei border. As well as having the above local uses, the through line, when completed through to Wuyi, will be a valuable link between the three railways concerned, and is regarded as likely to be of considerable importance in national defence.

MANCHUKUO

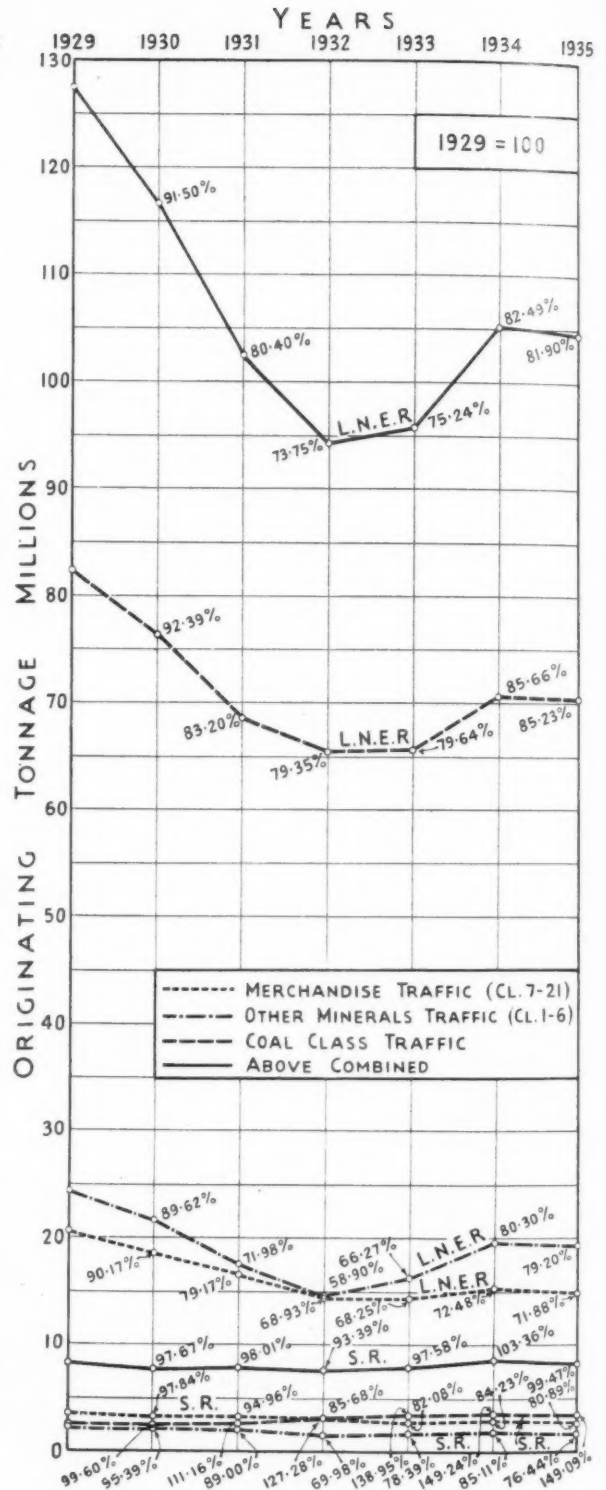
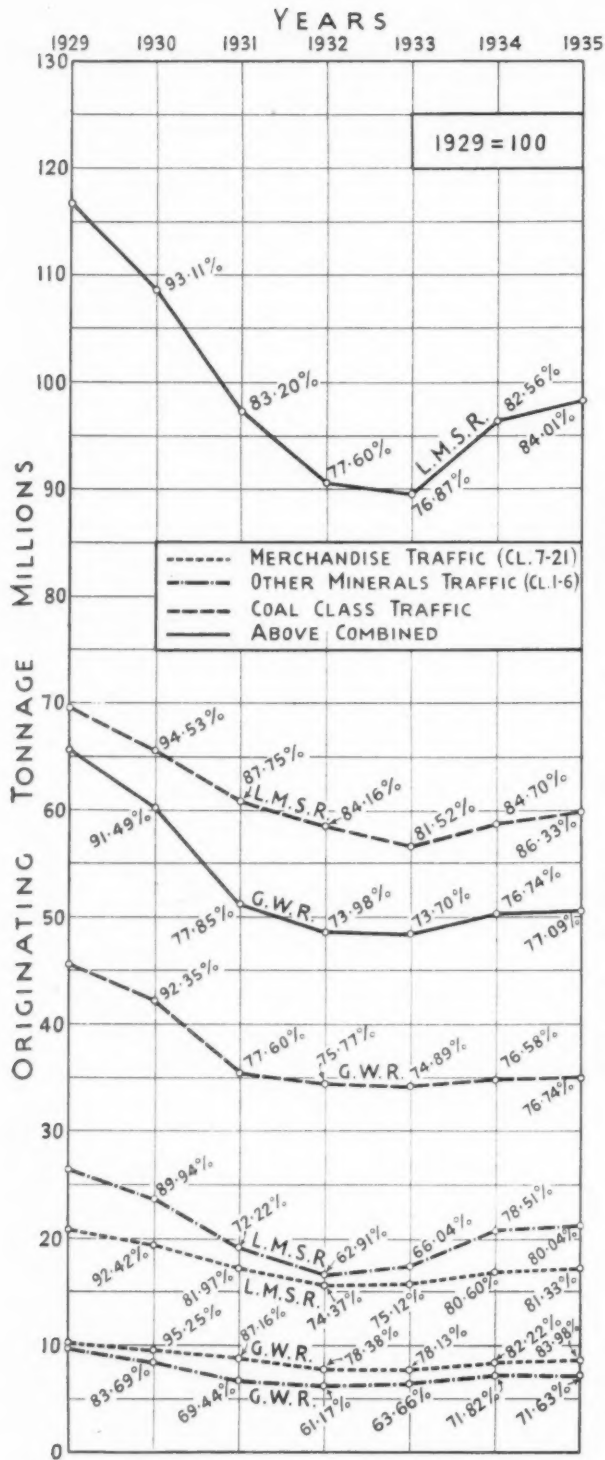
S.M.R. Activities

The Shakako workshops of the S.M.R. have now delivered to the Peiping-Shanhaikwan section of the Peiping-Mukden Railway, three first class observation, three dining, and three second class sleeping cars, as well as several third class coaches. Delivery was completed three days within the specified contract time.

A sum of Y. 3,000,000 is to be spent on a new passenger station on the western side of the Dairen waterfront, the construction of which is to begin early in the new year. A goods depot will also be added at a cost of Y. 300,000.

New Branch Opened

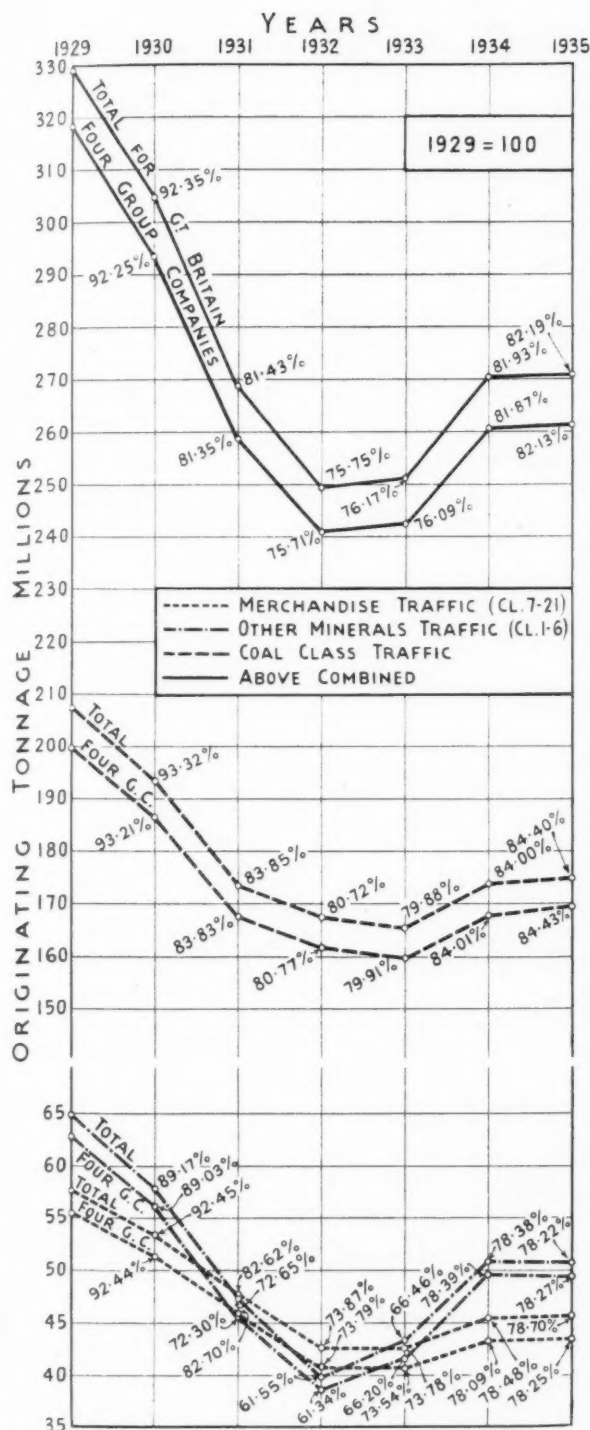
The Ssuningkai—Hsian branch of the S.M.R. was opened for traffic on September 1. It is 82 km. in length, taps the Hsian coalfield and opens up a promising agricultural area west of that town. As Hsian was already linked to the Mukden—Kirin line, it follows that the opening of the new line completes a cross connection between the Mukden—Harbin main and Mukden—Kirin lines, and coal and other Hsian produce will now flow directly via Ssuningkai to Hsinking, Harbin, Tsitsihar and the Solon line instead of round via Kirin.



Curves showing the fluctuations of tonnages originating on the four main-line British railways during the past seven years, plotted with 1929 as the basic year

BRITISH RAILWAYS FREIGHT TRAFFIC, 1929-1935

A graphic demonstration of the effects of the economic slump on tonnages carried during the last seven years



Curves showing the fluctuations of total tonnages originating on British railways during the past seven years, plotted with 1929 as the basic year

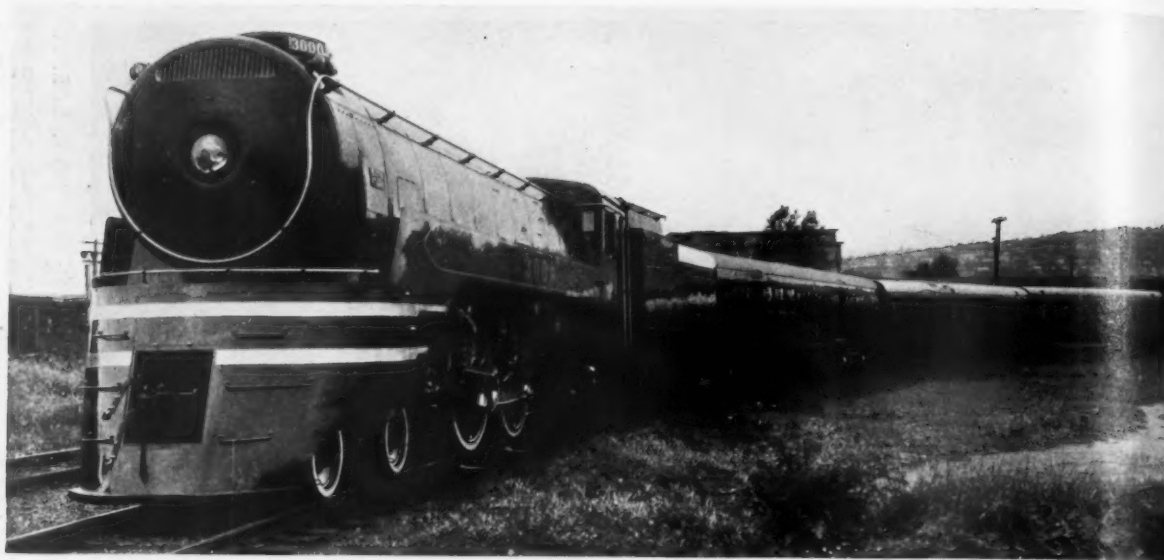
THE accompanying graphs, which show the fluctuations in the various classes of freight traffic carried by the British railways during the period 1929-35, have been prepared from figures handed in as evidence by Mr. Ashton Davies (Chief Commercial Manager, L.M.S.R.) to Mr. Gleeson Robinson (Traffic Commissioner for the Metropolitan Area and Licensing Authority for the London Traffic Area) during the course of the recent hearing of the application by Bouts-Tillotson Transport Limited for the renewal of "A" licences. The vertical scales are in terms of originating tonnage, shown in units of millions of tons. Against each plotting it will be noticed that there is also marked the percentage it represents of the corresponding figure on the same curve for 1929, which, for convenience, has been taken as the basic year. Limitations of space have made it necessary to include two sets of curves on each graph. Thus it will be seen that the L.M.S.R. and G.W.R. curves appear on the first graph, the L.N.E.R. and the Southern Railway on the second, and the total for the four group companies and the total for Great Britain on the third. For each railway, for the four group railways together, and for Great Britain as a whole, four separate curves are given, showing the variations in originating tonnage of merchandise traffic (classes 7-21); other mineral traffic (classes 1-6); coal class traffic; and all three classes of traffic combined.

It will be seen from these graphs that on the four group railways the originating tonnage of merchandise, minerals, and coal together was in 1935 82.13 per cent. of the corresponding total for 1929. Traffic in classes 7-21, which is most affected by road competition, was 78.25 per cent. of the 1929 total, and classes 1-6 (minerals and merchandise) in 1935, gave 78.27 per cent. (against 78.70 per cent. in 1934) of the corresponding tonnage in 1929, whereas the coal tonnage of 1935 was 84.43 per cent. of 1929. The worst percentage of higher class merchandise was the 73.79 per cent. of 1932, and of classes 1-6 was the 61.34 per cent. of 1932. In coal the lowest percentage was that of 79.91 in 1932.

Taking individual companies, it will be found that on the L.M.S.R. the higher class merchandise percentage in 1935 was 81.33 per cent. of the 1929 figure, and that 1932 showed the lowest percentage, namely 74.37. This company's percentage of traffic in classes 1-6 dropped in 1932 to 62.91, but rose in 1935 to 80.04. L.M.S.R. coal class traffic in 1935 was 86.33 per cent. of the 1929 figure. On the L.N.E.R., merchandise tonnage in classes 7-21 was in 1935 71.88 per cent. of that of 1929, with 1933 as the worst year, when the percentage fell to 68.25. Merchandise in classes 1-6 fell on the L.N.E.R. to 58.90 per cent. in 1932, but improved to 79.20 per cent. in 1935. Coal class tonnage in 1935 was 85.23 per cent. Under each heading, however, this company's percentages in 1934 were slightly better than those of 1935. Great Western higher class merchandise in 1935 was 83.98 per cent. of the 1929 total, with 1933 (78.13 per cent.) as the worst year. Classes 1-6 gave a percentage of 71.63 in 1935, against 71.82 in 1934, with the 1932 percentage of 61.17 as the worst. Great Western coal in 1935 was 76.74 per cent. of the 1929 total. On the Southern it is remarkable that the percentage of the three classes of traffic taken together in comparison with 1929 was 103.36 in 1934, and the percentage of tonnage in coal traffic was 149.09 per cent. in 1935.



AMBERGATE, THE TRIANGULAR JUNCTION OF THE MANCHESTER, SHEFFIELD, AND DERBY LINES, MIDLAND DIVISION, L.M.S.R.
 This important junction, one of the few with a complete triangle of platforms, lies some 10 miles north of Derby at the gateway to the Derbyshire dales route to Buxton and Manchester, and the west to north route to Clay Cross, Sheffield, and Leeds. The train seen in the photograph is travelling towards Manchester. A description of the widening works carried out on the Derby side of Ambergate since this photograph was taken, appeared in "The Railway Engineer" for October, 1931 (see article opposite)



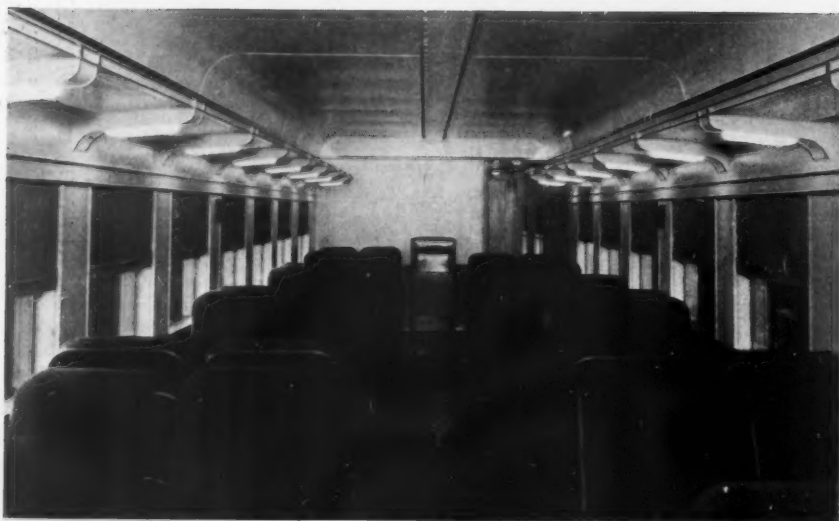
**Canadian Pacific Rail-
way new Light-weight
Semi-streamlined
Train**

(See article opposite)

*The exterior of the train,
headed by "Jubilee" class
4-4-4 locomotive No. 3000 may
be seen in the illustration above*



*Above : Interior of buffet com-
partment of baggage and buffet
car*



*Left : First class coach showing
prismatic lens electric lights on
under sides of luggage rack sup-
porting brackets*

CANADIAN PACIFIC RAILWAY SEMI-STREAMLINED TRAINS

(See illustrations on opposite page)

THE "Jubilee" class of 4-4-4 locomotive for hauling the new C.P.R. light-weight semi-streamlined trains was illustrated and described on page 229 in our issue of August 7 last, and we are now able to publish a few details of the trains. Four of them have been completed and three are now in service between Toronto and Detroit, Montreal and Quebec, and Calgary and Edmonton. Prior to going into regular service they made extensive tours of all points on both main and branch lines in the territories they serve, the Calgary—Edmonton train going right through to the Pacific Coast and calling at all branch stations. Some 310,000 people inspected the train on this tour and another train was visited by 70,000. One of them, also, was recently on exhibition at Windsor station, Montreal, for four days, during which time it attracted 60,000 visitors. We understand that these trains have so far proved very popular in regular service, and are regarded as a happy mark of the C.P.R. Jubilee.

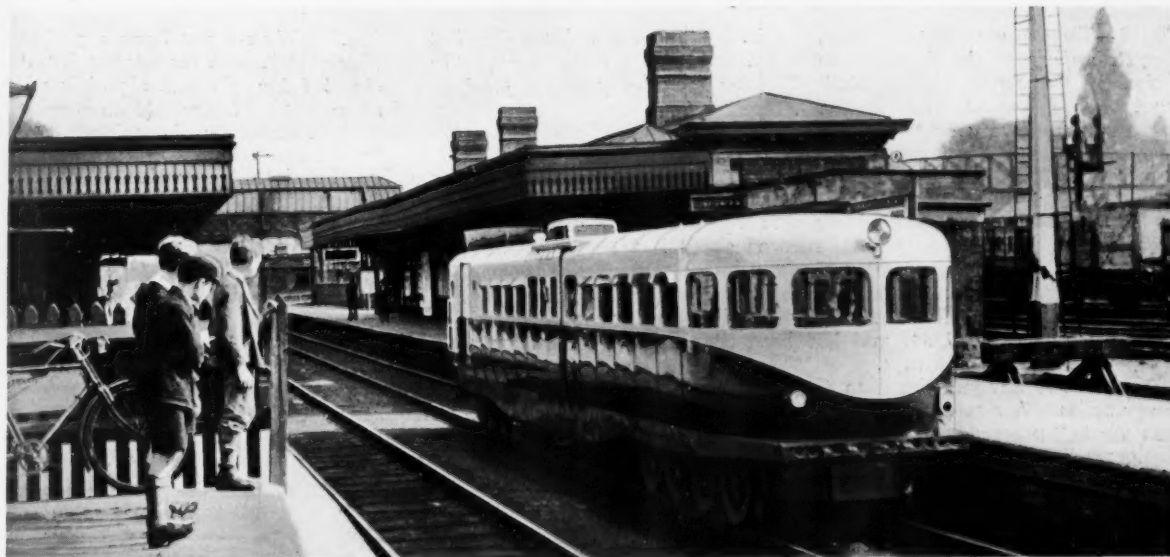
Each train consists of one mail and express car, one baggage and buffet car, and two first class passenger coaches. These coaches are of light-weight and semi-streamlined design. The roofs are elliptical, and the height from the rail to roof level is 12 ft. 11 in., while the width of the car at the top of the window is slightly greater than in the present standard cars. The side of the car has a slight bow extending from the roof edge to the window line and from the bottom of the window line to the bottom of the side sills. The coaches have four-

wheel bogie trucks in place of six-wheel, and are 73 ft. 10½ in. long over coupler knuckles.

The passenger coaches have a 6 ft. 6½ in. women's lounge, and a 12-ft. men's lounge, with a seating capacity, in the body of the car of 36 people. The seats in these cars are of the individual self-adjustable, reclining, rotating type, and are spaced much further apart than usual, thus providing the maximum of comfort for the passengers. The part of the car interior below the windows has been painted a fairly dark colour with a lighter colour on the pier panels up to the bottom of the basket racks, but the ceiling is a very light colour to assist in improving the lighting which is of an entirely new type, having individual prismatic lenses located on the bottoms of the brackets supporting the basket racks.

The mail and express car has a 30-ft. mail compartment and is equipped with electric light. The baggage and buffet coach has a 25-ft. baggage compartment and a 7 ft. 6 in. buffet counter which opens into the coach end of the car and is designed for the serving of light lunches. The seats in the compartment are of the bucket type. The buffet car and the coaches are air-conditioned. It is noteworthy that no extra fares, parlour or sleeping car charges are in force in connection with these new semi-streamlined train services. All the wheels of the locomotives, except the drivers, are mounted on SKF roller bearings, and the coaches run some on Timken and some on Shepard roller bearings.

Pneumatic-tyred Railcar in Service on L.M.S.R.



The first of the Coventry-Michelin petrol-engined pneumatic-tyred railcars, described in our issue of June 19 last, has been operating a supplementary service on the L.M.S.R. lines in the Rugby district for the past two or three months. Normally the car has been in charge of a driver supplied by the builder, Armstrong-Siddeley Motors Limited, but with an L.M.S.R. pilot driver on board. From Monday to Friday the car maintains the following service: 9.10 a.m. Rugby to Coventry via Leamington Spa and return from Coventry at 10.50 a.m. via the same

route; 11.43 a.m. Rugby to Leamington Spa and return at 12.30 p.m.; 1.7 p.m. Rugby to Nuneaton via Leamington Spa and Coventry, and return from Nuneaton via Coventry and Brandon at 2.45 p.m. The illustration above shows this 275 b.h.p. 56-seater vehicle leaving Leamington Spa en route for Coventry.

Another vehicle of the same type is almost completed at the Armstrong-Siddeley works, and may be subjected to similar trial running to a regular schedule on other British routes.

COLOUR-LIGHT SIGNALS ON THE SWISS RAILWAYS

Aspects employed render numerous lenses necessary

IN our issue of February 7, 1935, we published an article explaining the new distant signals adopted by the Swiss Federal Railways, and are now able to give some illustrations of them and of home signals, similar to those shown on the signal diagram accompanying that article.

Fig. 1 (below) shows a three-aspect distant signal dis-

of route indication is thus conveyed in the latter case. A reserve red lens is provided in case of failure.

Fig. 3 shows a similar home signal combined with a distant signal, as in Fig. 1, for the next signal ahead. The third green lens is not required on these particular home signals, and its place is blank, but were it present there would be eleven lenses in all in Fig. 3. This may



Fig. 1—Three-aspect distant signal near Rothenburg, on the Olten-Lucerne section of the Swiss Federal Railways, with automatic train control track magnets



Fig. 2—Three-aspect home signal at Würzenbach, near Lucerne, not yet in use (fourth-aspect not fitted)

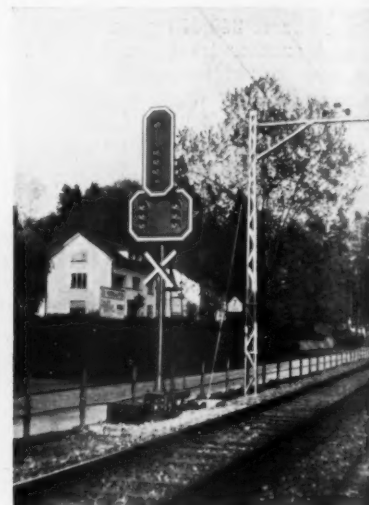


Fig. 3—Three-aspect home signal at Würzenbach, with three-aspect distant signal below, for next signal in advance, not yet in use. (Fourth-aspect in home signal not fitted)

playing two yellow lights horizontally when the home signal ahead is "on," two green lights diagonally when it is "off" for a normal speed route, and a yellow light and a green light diagonally when reduced speed is required at the home signal. At the side and in the centre of the track the track magnets for the automatic train control may be seen. This system was described in our issue of February 16, 1934, and has been standardised by the Swiss Federal Railways.

Fig. 2 shows a home signal to which such a distant signal applies. A single red light indicates "stop," one green light "proceed at normal speed," and two, or three green lights "proceed at reduced speed." A degree

seem a large number, but is not excessive when it is realised how many indications can be conveyed. Three distinct routes can be indicated, and three conditions of the signal in advance as well.

The signals in Figs. 2 and 3 are not yet in use, being marked with X signs. The white border line to the signal backgrounds assists in locating them on curves before the lights are seen clearly, or if they fail altogether. With electricity so generally obtainable, there is no doubt that light signals will become extensively used in Switzerland, where winter conditions interfere with mechanical transmissions. Electric lighting of the semaphores and discs is already used at a great many stations.

"Door-to-Door" Goods Wagons

Road transporters used in Germany for conveying goods wagons between railway depots and factory premises without rail connection, have been described in these pages as recently as our issue of April 12, 1935. We now illustrate opposite a somewhat similar system of conveyance for standard-gauge rolling stock, in this case devised for transferring goods without unloading from a main line to a narrow-gauge railway serving various industrial premises. The railway in question is the Barmer Bergbahn, a 30-mile metre-gauge line having a joint station with the Reichsbahn at Barmen. Since the new

facility has been in operation, increasing traffic arising from its popularity has necessitated the construction of another electric locomotive, and the purchase of more transporters. The locomotive illustrated will haul four main-line goods wagons with a load of twenty tons each up a gradient of 1 in 25. The transporters will carry up to thirty-three tons apiece. One of our illustrations shows a 15½-ton tank wagon loaded ready for transport over the light railway. Similar transporters are widely used by German narrow-gauge systems, and even by street tramways.



"Door-to-Door" Goods Wagons

*(See article at foot of
opposite page)*

Three views on the Barmer Bergbahn, a German metre gauge railway on which standard gauge wagons are conveyed direct from the main line goods depot to factory premises by means of the transporters shown in the illustrations. In the top view is seen a train of standard gauge covered vans ready for transit over the light railway, while the method of mounting is clearly seen in the central illustration. The third illustration shows a powerful electric locomotive capable of hauling four loaded wagons up a gradient of 1 in 25



NEW STEEL MELTING FURNACES AT CREWE WORKS, L.M.S.R.

Sesci furnaces using pulverised fuel and scrap steel



Close view of one of the furnaces

SOME new Sesci furnaces have recently been installed at the Crewe works of the London Midland & Scottish Railway, where they are used for melting steel, and they are illustrated and described herewith. Each furnace is in form a cylindrical barrel with two cone ends, built of boiler plate and strongly reinforced. On the cylindrical portion two cast iron pathways are provided. The body of the furnace rests on four steps of double rollers, and the rotary movement is obtained by a $7\frac{1}{2}$ -h.p. motor coupled to a David Brown reduction gear, and an automatic switch of somewhat special design. The switch is operated by a number of push buttons and enables the furnace to produce either a complete rotation in both directions with automatic reversal, or a slow rotation in the tapping direction and a faster one to stop the flow of metal. Finally a partial rotation can be obtained in either direction to any extent desired.

The hot gases coming from the furnace are collected in a movable head and directed into the flues. In the flues there is an air-heater of special construction designed to give a very rapid transmission of heat from the gases to the combustion air, yet completely air-tight. A by-pass is provided so that any required proportion of the hot gases can be sent through the recuperator or direct up the chimney. By means of this preheater the combustion air is rapidly brought to a temperature of 400°C. to 600°C. , and by means of a by-pass this temperature is regulated at will. For charging, the movable head is displaced and uncovers the entrance to the furnace as shown in one of the accompanying illustrations. For sampling the metal, the same procedure is followed.

The Sesci furnace is not fed directly through a pulveriser but from a hopper to which is attached a feeder of variable output. The rate of feeding of the combustion air can also be regulated, the Rootes blower being provided with a speed indicator and control panel. Since both air and fuel can therefore be introduced in the burner in any proportion, a positive control can be maintained over the oxidising conditions in the furnace.

Another interesting feature is the burner itself. Con-

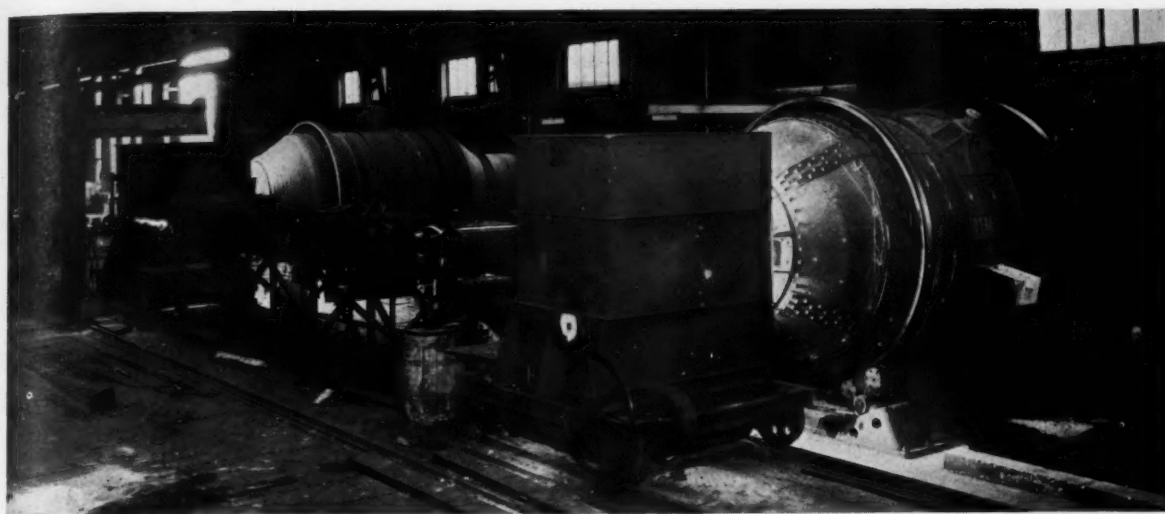
trary to the large majority of pulverised fuel furnaces, it is of very wide area and low pressure, the object being to obtain as slow a passage of the gases through the furnaces as possible. The fuel used for starting up is bituminous coal; when the air temperature has reached a suitable level the change-over to anthracite is operated. This permits the whole of the combustion air to be heated up to a much greater extent than with bituminous coal, and it is claimed that the use of anthracite has also decided metallurgical advantages.

Operation

The charge being introduced in the furnace, the blower is set in motion and a flow of bituminous coal introduced in the air pipe. The bituminous coal ignites readily and the air temperature rises very quickly. After 10 to 15 minutes it has reached some 180°C. , and anthracite is introduced in the flow of coal. Gradually the bituminous coal is cut off until after about 20 to 30 minutes only low volatile fuel is used. Every few minutes the furnace is given a partial rotation to ensure even heating up. When after about an hour the charge is showing signs of pastiness, the full rotation movement is imparted and the rotation thereafter becomes automatic. This procedure applies to starting up from cold and for the following heats no bituminous coal is necessary.

A charge of $4\frac{1}{2}$ tons of steel reaches the molten stage in approximately two hours. Care is taken that the bath contains a sufficiency of carbon to produce a controlled carbon boil. Samples of metal and slag are taken during the ensuing hour until the metal is properly conditioned and has reached the required carbon content. The de-oxidation of the metal takes place in the furnace in accordance with the usual acid Martin Siemens practice, and the metal can be ready for pouring in 3 to $3\frac{1}{2}$ hours.

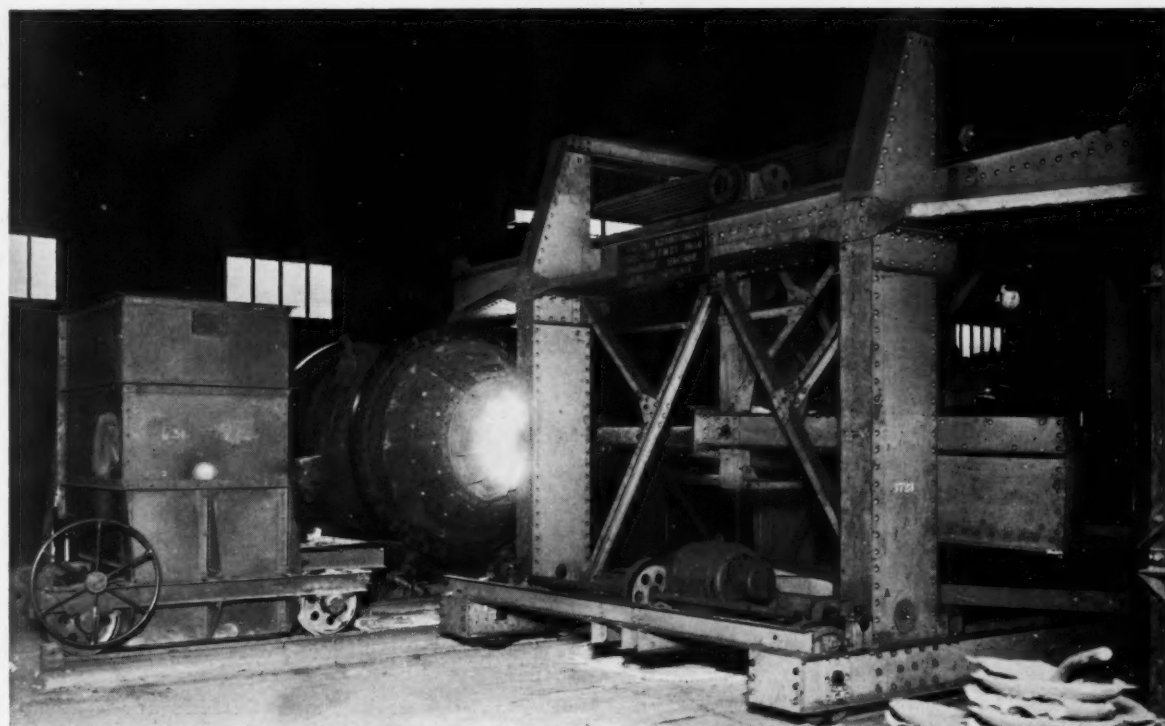
The general procedure in this furnace is very much like that adopted in the acid Siemens system. The essential difference lies in the fact that the charge is composed of steel scrap only, or of steel scrap with a very small percentage of pig-iron. Whereas in the Siemens system



General view of the installation

reliance is placed on the exothermic reaction of the combustion of carbon to give the metal its final temperature, in the Sesci the high flame temperature combined with the rotary movement is sufficient to impart to the metal all its required heat and in a considerably shorter time than is possible in a static furnace. At Crewe the practice is to start the bath with a carbon of slightly over 0.3 per cent., against an average of 1.5 per cent. in the acid Siemens. As in any other acid process, however, a rigorous choice of raw materials is indispensable for the

analysis to meet with the somewhat exacting specification of locomotive work. When the metal is ready for pouring, the tap hole is opened, the ladle brought in the casting pit, and the charge then removed to the casting floor to be poured into the moulds. The furnaces are working at a rate of two to three heats a day each, but this production is susceptible to increase. The furnaces are made in England and sales are controlled by Rotary Furnaces Limited, 1, Place du Champ de Mars, Brussels, and 46, Victoria Street, London, S.W.1.



One of the furnaces being charged



The Gotthard express about to enter a tunnel on the lowest of the three "levels"—the other two of which can be seen above—on the well-known spiral zig-zags on the Gotthardbahn section of the Swiss Federal Railways



Above : The Furka-Oberalpahn (Switzerland) where snow has to be cleared even at midsummer, due to the altitude of the line

Left : The Sernfthalbahn section (Switzerland) relaid through a freshly excavated cutting after an avalanche ; 272 men took 21 days to clear this cutting and restore the track

Sou
T
way
men
ber
M
Engl
South
neer
Wen
retir

Ra
Co
At
Man
the J
Octo
Vice-
Midla
was
man
year

At
tende
the F
Octo
Passe
Lond
way
unani
man
Super
the y
Barrin
dent,
Railw
Weste
mousl
the O
Confer

Also
way co
Confer
Mr. A
mercia
Midlan
was u
man o

Fro
Octob
Officer
A. H.
attain
recall,
of O
Mount
Railwa

The
nounc
(Chair
Limit
been o
of the
the bo
the la
Bt.

RAILWAY NEWS SECTION

PERSONAL

SOUTHERN RAILWAY DOCKS ENGINEER

The Directors of the Southern Railway have made the following appointment to take effect from November 1:—

Mr. M. G. J. McHaffie, Resident Engineer, New Dock Works, Southampton, to be Docks Engineer in succession to Mr. F. E. Wentworth-Sheilds, who will retire on October 31.

RAILWAY CLEARING HOUSE CONFERENCE APPOINTMENTS

At a meeting of the General Managers' Conference, held at the Railway Clearing House on October 6, Mr. W. V. Wood, Vice-President of the London Midland & Scottish Railway, was unanimously elected Chairman of that conference for the year 1937.

At a meeting of the Superintendents' Conference held at the Railway Clearing House on October 21, Mr. C. J. Selway, Passenger Manager of the London & North Eastern Railway (Southern Area), was unanimously re-elected Chairman of the Coaching Traffic Superintendents' Conference for the year 1937, and Mr. V. M. Barrington Ward, Superintendent, London & North Eastern Railway (Southern Area, Western Section) was unanimously elected Chairman of the Operating Superintendents' Conference.

Also, at a meeting of the railway companies' Goods Managers' Conference held on October 22, Mr. Ashton Davies, Chief Commercial Manager of the London Midland & Scottish Railway, was unanimously elected Chairman of the conference for 1937.

From the *London Gazette* of October 23: Regular Army Reserve of Officers; Royal Engineers: Lt.-Col. A. H. L. Mount, C.B., C.B.E., having attained the age limit of liability to recall, ceases to belong to the Reserve of Officers (October 17). Lt.-Col. Mount is Chief Inspecting Officer of Railways, Ministry of Transport.

The Port of London Authority announces that Mr. H. Eric Miller (Chairman of Harrisons & Crosfield Limited, East India Merchants) has been co-opted by the elected Members of the Authority to fill the vacancy on the board created by the retirement of the late Sir Charles Campbell McLeod, Bt.

Sir George McLaren Brown, K.B.E., who, as announced in *THE RAILWAY GAZETTE* of October 2, is retiring at the end of this month from the position of European General Manager, Canadian Pacific Railway, has been for nearly 50 years in the service of that company. Born at Hamilton, Ontario, in 1865,



Sir George McLaren Brown, K.B.E.,
European General Manager, Canadian
Pacific Railway, 1910-1936

Sir George was educated at Shrewsbury, at Hamilton Grammar School and at the Upper Canada College, Toronto. He began his railway career as a traffic officer in British Columbia in 1887, and was early employed in organising the Pacific Coast traffic of the C.P.R. In 1892 he was promoted to be General Traffic Manager and Executive Representative of the company in British Columbia, but in 1902 was transferred to Montreal as General Superintendent, Hotels, Dining and Sleeping Cars. In 1907, however, under the title of Atlantic Steamships Traffic Manager, he was called on to establish a traffic organisation in Canada and the United States for the Atlantic service recently inaugurated by the Canadian Pacific Railway. In the following year, Sir

George came to England as General Traffic Manager and was made European General Manager two years later. During the war he was Assistant Director-General of Movements and Railways at the War Office, serving in that capacity until April, 1919, and was created a K.B.E. (Military Division) in 1919 in recognition of his services during the war.

On October 27, Sir George was entertained to dinner at the Wharnccliffe Rooms by the staff of the C.P.R. European organisation, and was presented with his portrait in oils. A presentation was also made to Lady McLaren Brown. More than 350 members of the Railway and Steamship staffs attended the reception and the dinner; the Chairman was Mr. S. L. Furniss, for many years Sir George McLaren Brown's chief executive assistant.

INDIAN STAFF CHANGES

Mr. E. R. Casement has been confirmed as Divisional Superintendent, E.I.R., as from November 30 last.

Mr. T. C. Hales reverted to his substantive appointment as Deputy Chief Commercial Manager, N.W.R., on Sept. 1.

Mr. H. M. R. Morse, Officiating Superintendent Mechanical Workshops, N.W.R., has been granted five months' leave as from October 16.

Mr. B. C. L. Bean, Divisional Superintendent, N.W.R., has been granted one year's leave as from October 22.

Mr. R. C. Case, Deputy Transportation Superintendent (Power), G.I.P.R., has been appointed to officiate as Director, Railway Board.

On return from leave Mr. C. W. Scott, I.F.S., assumed charge of the duties of Timber Advisory Officer, Railway Board, as from September 21.

We regret to record the death in Buenos Aires, on September 10, at the age of 61 years, of Dr. Luis Lagos Garcia, who had been one of the lawyers of the Central Argentine Railway since 1906, and had also acted in a similar capacity to the Buenos Aires and Pacific and Entre Rios and Argentine North Eastern Railways. He was a member of the Argentine Mission, headed by Dr. Manuel Augusto Montes de Oca, which visited London in 1899, in connection with the arbitration in regard to the Argentine-Chilean boundary question.

Sir Herbert Walker, K.C.B., General Manager, Southern Railway, and Lady Walker sailed from Southampton last Friday on a visit to South Africa and the British Empire Exhibition at Johannesburg.

Sir Felix J. C. Pole, Chairman, Associated Electrical Industries, is at present on a visit to the United States.

Mr. F. Bushrod, O.B.E., who, as announced in our issue of October 23, is retiring tomorrow (October 31) from the position of Superintendent of

Mr. A. C. Harris, who, as announced in our issue of October 23, is retiring on October 31 from the dual position of Assistant in the Central Office and Principal Welfare Officer of the L.M.S.R., entered the service of the former L.N.W.R. fifty years ago in the General Manager's office, and has filled various positions in that department during his long career. In 1915 and for about seven years afterwards, he combined with his other duties the post of Assistant in charge of the Publicity and Advertising Department, and up to the time of the amalgamation he had

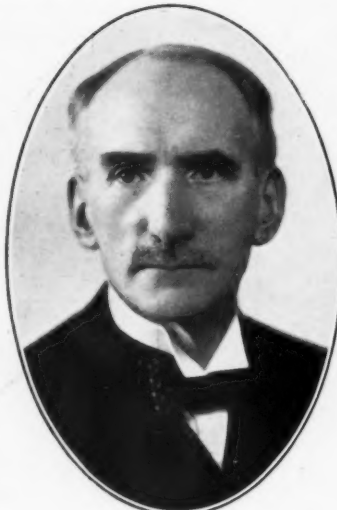
tionary Force, and as a military transport expert he came into contact with numerous British and American transport officers in the organisation of troop and supply train services. It was he who arranged for the transport of French troops to Italy in 1917.

We regret to announce the death, on October 17, in his 79th year, of Mr. R. Rowland, who from 1911 to 1923 was Superintendent of Passenger Services of the former Midland Railway. His death severs one of the last links with the



Mr. F. Bushrod, O.B.E.,

Retiring Superintendent of Operation,
Southern Railway



Mr. A. C. Harris,

Assistant (Central Office) and Principal Welfare
Officer, L.M.S.R., who retires tomorrow



The late Mr. R. Rowland,

Superintendent of Passenger Services,
Midland Railway, 1911-23

Operation, Southern Railway, was born in Southampton in 1875, and entered the service of the former London & South Western Railway at the dock station there in 1891. Two years later he was transferred to the office of the Assistant Traffic Superintendent at Waterloo, eventually rising to the position of Chief Clerk in that office. Meanwhile he specialised particularly in signalling work. In 1907 he was promoted to be Chief Clerk in the Main Line District Superintendent's office, and two years later was transferred to the office of the Superintendent of the Line. In 1911 Mr. Bushrod became Chief Clerk in that office and in January, 1916, was appointed to be Assistant London District Superintendent. In November of that year, however, he was promoted to be Assistant Superintendent of the Line. At the amalgamation in 1923 he became Assistant Chief Operating Superintendent, Southern Railway. It was in February, 1930, that Mr. Bushrod was appointed Superintendent of Operation, the position from which he now retires. He was elected Chairman of the Operating Superintendent's Conference, Railway Clearing House, for the year 1935; he was decorated with the O.B.E. in 1918.

served under eight general managers. In 1927 Mr. Harris was appointed Assistant (for Welfare) to the Chief Officer for Labour and Establishment, which position he has held up to the time of his retirement, in addition to his duties in the office of the President of the Executive as an Assistant to Mr. Glynne Roberts.

We regret to note the death, on October 22, of Dr. George Forbes, a pioneer in electric traction. As long ago as 1879 he advocated this form of traction, and in 1890 the City & South London Railway—though designed and constructed for cable haulage—was opened for electric operation as a result of his recommendation in favour of the substitution of electric locomotives for cables.

M. André Direz, late Chef de l'Exploitation of the French State Railways, whose death—at the age of 64, following a surgical operation—was announced in our issue of October 16, was an officer of the Legion of Honour, and was well known in British and American circles in Paris. During the war he collaborated with General W. W. Atterbury, Director of the railway system of the American Expedi-

Midland Railway of pre-war days and with the timetable history of the "competitive" years at the beginning of the century. Mr. Rowland entered the Midland Railway service in the Goods Department at Matlock in June, 1874, and, after two years as a relief clerk at Derby, was transferred to the timetable office in June, 1880, where he became Chief Clerk in July, 1890. He was appointed head of the timetable and train-working section in 1894, and, under four Superintendents of the Line, carried out all the train service revisions that marked Midland Railway history between 1895 and 1905. Subsequently, under Mr. (now Sir) Cecil Paget, he was responsible for bringing the passenger train service to the high level of efficiency and punctuality it enjoyed in the years prior to the war. Mr. Rowland was appointed Superintendent of Passenger Services, in succession to Mr. John Bagwell, in December, 1911. During the difficult war period and the years of re-construction which followed, he carried on the timetable work under Mr. J. H. Follows, and, after a breakdown in health, retired in June, 1923, at the age of 65. He subsequently recovered a measure of health and

school
a nu
inclu
Man
tensi
Assis
Engi
the
Lond
the c
railw
of th
water
and c
in E
point
and
dock,
gravi
appoi
Lond
1909.
Went
Docks

took a great interest in the Derbyshire Lawn Tennis Association, acting as Hon. Treasurer from 1927 to 1933.

Mr. Francis Ernest Wentworth-Sheilds, O.B.E., M.Inst.C.E., who, as announced above, is retiring tomorrow from the position of Docks Engineer, Southern Railway, was born in 1869 and was educated at St. Paul's School, where he gained junior and senior

Department, Southern Railway, at the beginning of 1924, the position from which he now retires. During this period the great scheme of docks extensions at Southampton has been designed and carried out under his direction. These include the $1\frac{1}{2}$ mile of deep water quay for the accommodation of eight of the largest vessels, the King George V graving dock, built specially for the "Queen Mary," and

as announced above, has been appointed to succeed Mr. F. E. Wentworth-Sheilds, O.B.E., M.Inst.C.E., as Southern Railway Docks Engineer, at Southampton, has during his service in the Docks Engineer's Department, been associated with practically all the development of the docks at Southampton since the London & South Western Railway began its programme of extensions after acquiring the undertak-



Mr. F. E. Wentworth-Sheilds, O.B.E.,
Docks Engineer, L.S.W.R. and Southern
Railway, 1909-1936



Mr. M. G. J. McHaffie,
Appointed Docks Engineer,
Southern Railway

scholarships. He was then engaged on a number of notable engineering works, including the Salford docks of the Manchester Ship Canal, and dock extensions at Southampton, 1892-6, as Assistant Engineer. He was Resident Engineer 1896-9 on the construction of the North Cornwall extension line, London & South Western Railway; on the construction of the Bakerloo tube railway, 1899-01; on the construction of the Trafalgar graving dock and deep-water quays at Southampton, 1901-5; and on the building of the Isna barrage in Egypt, 1905-7. He was then appointed Chief Engineer for the design and construction of the White Star dock, and the widening of Trafalgar graving dock at Southampton, being appointed Docks Engineer to the London & South Western Railway in 1909. After the amalgamation, Mr. Wentworth-Sheilds was appointed Docks Engineer, Docks and Marine

the reclamation of 400 acres of mud-lands. He is a Member of Council of the Institution of Civil Engineers, and Chairman of their Earth Pressures Committee, a Member of Council (and Past President) of the Institution of Structural Engineers, Chairman of the Cement Committees of the British Standards Association, and a Member of the Sea Action Committee of the Institution of Civil Engineers. In 1919-20 he visited Calcutta at the request of the Port Commissioners to advise and report on the lay-out of new docks. In 1914 he was awarded the George Stephenson Gold Medal of the Institution of Civil Engineers, and in 1921 was "Vernon Harcourt" Lecturer. He has been a representative of the Southern Railway on the Southampton Harbour Board.

Mr. M. G. J. McHaffie, M.Inst.C.E., M.Soc.Ing.C. (France), M.Inst.T., who,

among the earlier engineering features with which he was connected, were the construction of the cold store, engine house, boiler house, &c., and of the coal barge quay and jetty near the Outer Dock, which were among the earliest and largest structures of their kinds in this country to be built in reinforced concrete. In 1907, Mr. McHaffie was temporarily transferred to the Chief Engineer's Department, and was engaged on the construction of the locomotive works and offices at Eastleigh. Upon returning to Southampton, he was associated with further developments then in hand, including the Ocean Dock, and the widening of Trafalgar graving dock to accommodate ss. *Olympic* and other large vessels. During the war he served with the Corps of Royal Engineers, attaining the rank of Acting Major. Upon returning to the service of the L.S.W.R., he took an active part in

the various schemes of reconstruction, and also in the construction of the reinforced concrete mooring dolphins, steel bridges, dredging and other subsidiary works for the 60,000-ton floating dock, opened by H.R.H. The Prince of Wales (now King Edward VIII) in 1924. In recent years Mr. McHaffie has filled the responsible post of Resident Engineer on the New Docks at Southampton. This work has included a new quay wall about a mile and a half long with 45 ft. of water alongside at low tide, the King George V graving dock (the largest in the world), opened by H.M. King George V in 1933; the reclamation of over 400 acres of mudland; passenger and cargo sheds covering an area of over twenty acres; roads, railways, and various buildings. Mr. McHaffie is a Member of the Institution of Civil Engineers, a Member of the Société des Ingénieurs Civils de France, and a Member of the Institute of Transport.

We regret to record the death, on October 27, of Mr. William Thomas Weeks, who was Chief Stores Superintendent, L.N.E.R., from March, 1923, until the end of 1924, when he retired owing to ill-health. He was 73 years of age.

The retirement at the end of October of Driver William Sparshatt, after 46 years' service, ends the railway career of one of the most noted L.N.E.R. drivers, whose reputation was made first on the London—Leeds Pullman workings, and later on the King's Cross—Newcastle services, including the Silver Jubilee. His best-remembered feat is the attainment of 108 m.p.h. with the engine *Papyrus* on an experimental run on March 5, 1935.

LUNCHEON TO MR. E. J. MISSENDEN

A very pleasant little function took place at the Charing Cross Hotel on Thursday, October 15, when the principal assistants in the Southern Railway Traffic Department entertained

Mr. E. J. Missenden, the new Traffic Manager, on the occasion of his taking up his duties at Waterloo.

Mr. J. B. Elliot, Assistant Traffic Manager, presided, and in welcoming Mr. Missenden, said that no one present doubted that he was in every way qualified to succeed Mr. Cox, and that his brilliant success at Southampton as Docks and Marine Manager was sufficient evidence of this. As a former Divisional Superintendent he had an unrivalled experience of the Traffic Department, which would stand him in good stead. His principal assistants wished to assure him of their pleasure that he had been appointed to the head of the department, and they would serve him loyally to the best of their ability.

Mr. H. E. O. Wheeler, who succeeds Mr. F. Bushrod as Superintendent of Operation at the end of the present month, Mr. W. M. Perts, Commercial Assistant, Mr. C. Cooper, Continental Assistant, and Mr. W. J. England, Assistant Superintendent of Operation, also associated themselves with Mr. Elliot's remarks.

Mr. Missenden, in reply, stated that he was exceedingly gratified to receive the invitation to lunch, and appreciated the thought which prompted it. He looked forward to a happy association with them all, and felt certain that they would always give him the benefit of their experience and advice.

PRESENTATION TO MR. E. C. COX

At a meeting of the Railway Clearing House Superintendents' Conference held on October 21, Mr. E. C. Cox, who recently retired from the position of Traffic Manager of the Southern Railway, was the recipient of a presentation from the members of the conference.

Mr. C. J. Selway (London & North Eastern Railway), Chairman of the conference for the current year, in making the presentation, referred to the very valuable services Mr. Cox had rendered to the conference (of which he had

been a member since July, 1911, and Chairman during the years 1919, 1920, 1926, 1931, and 1935) and particularly to the exceptional duties he performed during the years 1919 and 1920 when in his capacity as Chairman he gave exhaustive evidence on behalf of the railway companies before the Rates Advisory Committee in respect of the revision of fares and rates. Reference was also made to Mr. Cox's long and distinguished railway career, and to the competent manner in which he had performed the services allotted to him in connection with the staff negotiations following the war period. Mr. Selway stated that the conference would be sorry to lose Mr. Cox and he would be missed not only for his great knowledge, ability, and experience, but also for the ready understanding, integrity, and other qualities which had endeared him to all. In asking Mr. Cox to accept from the conference an onyx clock, together with Chinese ornaments of mother of pearl, also a pair of figures in bronze, onyx, and ivory, the Chairman expressed the hope that Mr. Cox would enjoy many happy years in his well-earned retirement.

Mr. Ashton Davies and Mr. Byrom (London Midland & Scottish Railway) and Mr. Potter (Great Western Railway) also spoke reiterating the sentiments expressed by Mr. Selway.

Mr. Cox, in thanking the conference for its gifts, expressed his appreciation of the many kind things said by his old colleagues. He had always felt it a privilege to be a member of the conference and when elected to preside over it had always received the greatest possible help from all the members. He was deeply grateful for the gifts which would be treasured by Mrs. Cox and himself as presents from his greatest and closest friends.

Mr. W. G. Hornett, M.I.Mech.E., of Gresham & Craven Limited, has been appointed General Manager of the Sentinel Waggon Works (1936) Limited.

Mrs. Charles Hambro, wife of the Deputy-Chairman of the Great Western Railway, receiving a basket of flowers when she attended the G.W.R. Royal Hotel, Paddington, to select prize-winning entries in a recent scheme promoted on behalf of the staff "Helping Hand" Fund. Seated next to Mrs. Hambro is Lord Palmer and Mr. R. G. Scarsbrook, Chairman of the fund. Among others in the group are: Mr. F. R. E. Davis, Secretary of the company, Mr. H. Adams Clarke, Staff Assistant to the General Manager; Mr. C. T. Cox, Divisional Superintendent, Paddington; Mr. G. H. C. Wiltshire, Chief Cashier; Mr. F. C. Hockridge, Assistant Surveyor; Mr. R. A. P. Setterfield; and Mr. R. O. Rogers, General Manager's office



Institution of Mechanical Engineers: Annual Dinner

Sir H. Nigel Gresley, C.B.E., D.Sc., this year's President of the Institution of Mechanical Engineers, presided over the annual dinner of the institution at Grosvenor House, Park Lane, London, on Thursday, October 22. Nearly 600 members and guests were present, and the latter included many distinguished representatives of scientific and industrial bodies, and of the Navy, Army, and Air Force. After the loyal toasts had been honoured, Sir John E. Thornycroft, K.B.E., Vice-President of the institution, proposed the health of the guests. He referred to the recent appointment of Sir Harold A. Brown, K.C.B., a Member of Council of the institution, who was present, as Director General of Munitions Production, and to the presence of the Rt. Hon. Walter Runciman, P.C., LL.D., President of the Board of Trade, as a member of the Government. Sir John said that Sir Nigel Gresley might be proud that so many representative men had gathered round him on this occasion, and suggested that many had come remembering that this had been a year of outstanding achievement in mechanical engineering, of which the President's Silver Jubilee train and the *Queen Mary* were outstanding examples. The toast was associated with the name of the Earl of Crawford and Balcarres, P.C., K.T., LL.D., F.R.S., Hon. M.I.Mech.E., at whose hands Sir Nigel Gresley had received an honorary degree.

Lord Crawford, in a charming and witty reply on behalf of the guests, referred to Sir Josiah Stamp, who was amongst the guests as President of the British Association. He was fresh from his triumph at the annual gathering of the association at Blackpool, said Lord Crawford, and had assured him that his predilection in favour of the West Coast had been more than amply justified.

Mr. Walter Runciman then proposed the toast of the Institution of Mechanical Engineers, coupled with the name of the President. He referred to the many ways in which Sir Nigel Gresley had served the country, and mentioned in particular his recent chairmanship of a committee of the Board of Trade to investigate the steering gear and kindred appliances in vessels under the British flag. He also congratulated Sir Nigel on the success of the Silver Jubilee train. Mr. Runciman then went on to make a detailed statistical comparison of the present state of the country's trade and its state in 1931 just before the present Government took office. The exports of United Kingdom goods were 16 per cent. greater in volume and retained imports 35 per cent. more. Industrial production as a whole was nearly 40 per cent. greater. The mainspring of the revival since 1931, said Mr. Runciman, had been the spirit and atmosphere of the

business world which the country's economic and social policies had engendered. To enjoy full prosperity, however, there must be a substantial improvement in our overseas trade, and he hoped the recent devaluation of the currencies of the gold bloc countries in conditions of international co-operation would be followed by a widespread movement in the direction of the abolition of exchange restrictions and import quotas and the lowering of trade barriers generally.

Sir Nigel Gresley, in responding to the toast, thanked Mr. Runciman for his remarks and congratulated him on behalf of the members of the institution on the success of his policy. He mentioned that the monthly production of steel ingots and castings in this country, which in the boom year of 1929 amounted to 800,000 tons, and sank to 438,000 tons in 1932, had averaged 950,000 tons this year, and last

September had reached the record figure of 1,027,000 tons. Mechanical engineers had more to do with steel than the members of any other profession, and the significance of these figures to them was therefore evident. In conclusion, Sir Nigel referred to the growth of the membership and activities of the institution. The Council expected at their meeting the following day to elect additional members which would bring the total roll over the 12,000 mark. To be President of the institution had been one of the ambitions of his life. The institution was undertaking new researches and thus continuing to serve the best interests of the mechanical engineering profession.

Sir Ralph Wedgwood, C.B., C.M.G., Chief General Manager, L.N.E.R., was also among the guests present at the dinner, and Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R., was present in his capacity as President of the Institution of Locomotive Engineers.

"The Flow of Peoples"

The opening lecture of the Great Western Railway (London) Lecture & Debating Society's session was delivered at Paddington station on October 15, by Mr. W. W. Wakefield, M.P., who spoke on "The Flow of Peoples." Sir Robert Horne, G.B.E., K.C., M.P. (Chairman of the Great Western Railway Company), presided over a large attendance of members.

Sir Robert, having expressed his pleasure at again being present at the initiation of the debating society's winter curriculum, briefly introduced Mr. Wakefield. The subject he had chosen, said Sir Robert, was of great interest. Movements in connection with populations of the world had suffered considerable checks in recent times. Not very long ago the world was going to become a vast brotherhood, in which people would move freely from one country to another, but the more recent development of a somewhat extreme spurt of nationalism had changed the outlook.

Mr. Wakefield's address covered a wide field, and ranged from such local "flows of people" as were represented by suburban settlements, to great movements of races of people extending over vast distances and periods of time. The subject of migration of peoples could be divided, broadly, into four parts, namely, (1) temporary, (2) permanent, (3) local, and (4) far-distant. Under these heads the speaker gave interesting examples from various periods of history.

Although popular migrations for economic and religious reasons had been more or less continually taking place throughout history, it was the discovery of the great overseas continents, supplemented by improving

means of transport, that brought about those flows of peoples which had had the greatest significance for the modern world. The strongest urge to migration had always been economic, represented by the desire to occupy new territories for exploitation as hunting or tillage grounds in the search for an easier and more satisfactory way of life.

Migration from religious motives had also been both considerable in volume and significant in result. The flow of Huguenots from France to this country, and of the Pilgrim Fathers and their successors from England to America, had been greatly to the advantage of the countries which gave the exiles a refuge. The large negro population in America resulting from the transportation of African slaves was touched upon, as was the great flow of colonists from Britain and other European countries to the Americas, Australia, and New Zealand.

The lecturer spoke of the greater tendency for peoples nowadays to remain in their native countries—for a variety of compelling reasons—but made no prophecy as to future possibilities in the migration of peoples. Mr. Wakefield's address was cordially received, and an interesting discussion followed.

RAILWAY CONVALESCENT HOMES.—The family dinner of the Railway Convalescent Homes is to be held in the Wharnclyffe Rooms of the Hotel Great Central, Marylebone, on Saturday, November 7, when the chair will be taken by the President, Mr. Robert Holland-Martin, C.B., the Chairman of the Southern Railway Company.

Sir Nigel Gresley on the Silver Jubilee

Efficiency of streamlining discussed in presidential address to the Institution of Mechanical Engineers

In his presidential address to the Institution of Mechanical Engineers on October 23, Sir H. Nigel Gresley, C.B.E., D.Sc., Chief Mechanical Engineer, L.N.E.R., reverted to a subject which has not been dealt with in these circumstances for some thirty years, by taking as his theme the steam locomotive. He prefaced his address with a brief review of the steady annual progress of the institution that justifies the expectation of a membership of 12,000 by the end of this year, and referred to the forthcoming award of the James Watt International Medal for outstanding achievement in mechanical engineering, initiated in conjunction with the munificent bequest of the late Sir Dugald Clerk, H.R.H. the Duke of York, an Honorary Member of the institution, is to make the presentation of the first medal on January 22, 1937.

Previous presidents who had dealt with the steam locomotive in their addresses, said Sir Nigel Gresley, were Mr. Samuel Johnson, Locomotive Superintendent of the Midland Railway, in 1898, and Mr. Hurry Riches, Locomotive Superintendent of the Taff Vale Railway, in 1907. Although in his presidential address Mr. Johnson had deplored the limitations of the 4-ft. 8½-in. gauge and had expressed a desire for 5 ft. 3 in., modern locomotives had increased in power by 100 per cent. since his day, when no British engine weighed more than 100 tons with tender, and no express type developed a tractive effort higher than 19,400 lb. Express trains today commonly weighed 500 tons, and sometimes 600 tons, compared with the average for Anglo-Scottish services from Euston and King's Cross in 1898 of 260 tons, with a maximum of 300 tons.

The development of the high-speed railcar since 1932 had inaugurated a new stage in railway operation. In May, 1933, the German Flying Hamburger had gone into regular service, booked at an average speed of 77.4 m.p.h. Similar high-speed railcar services with Bugatti vehicles had been started in France in the summer of the same year, while in the U.S.A. the Union Pacific Railroad introduced a lightweight three-coach train propelled by an internal combustion engine. The demand for trains of greater capacity than these, but giving a service of comparable speed, had led to the development of high-speed, streamlined steam locomotives. In Germany a steam-hauled service between Berlin and Hamburg at an average speed of over 74 m.p.h. had been inaugurated in May this year. This might at first sight appear a harder task than the 71 m.p.h. average of the L.N.E.R. Silver Jubilee between Darlington and

London, but actually the performance of the British train was more meritorious in view of the long, steep gradients it had to negotiate, and certain compulsory speed restrictions.

The possibilities of high-speed travel had been brought home to him (the President) by a journey in the Flying Hamburger, when he had been much impressed by the smooth running over long distances at 100 m.p.h. He was furnished by the makers of that train with an estimate of the shortest possible running times between King's Cross and Newcastle, with a three-car articulated diesel set weighing 115 tons and generally similar to the German train, the schedule including an addition of 10 per cent. to what might be achieved under favourable conditions in allowance for bad weather and out-of-course delays. This schedule, prepared with the thoroughness characteristic of the German engineer, gave 4 hr. 17 min. for the up journey, and 4 hr. 15½ min. for the down.

But it was considered that the accommodation in a train of this type would be somewhat cramped on a 4-hr. journey for the 140 passengers who were to be seated, and the suggestion that an ordinary Pacific engine could maintain higher speeds with a train of greater weight was made by the Chief General Manager of the L.N.E.R. Accordingly the Silver Jubilee came into being, streamlining being adopted to help to ensure an ample margin of power. Modifications conducive to freer running and higher speeds uphill were incorporated in the design of cylinders and boiler.

Very satisfactory financial results had been achieved since the train went into service on September 30, 1935, gross receipts (excluding dining car profits) amounting to 13s. 11d. a mile. Operating expenses were 2s. 6d. a mile. The annual receipts from the 5s. first class and 3s. third class supplements alone were £12,000, or roughly 33 per cent. of the first cost of the train (£34,500).

The maximum speed of the Silver Jubilee did not normally exceed 90 m.p.h., the saving in time being secured by running uphill as fast as was usually common on favourable gradients. Dynamometer car records showed that a drawbar horsepower of about 400 sufficed to maintain 80 m.p.h. with this 220-ton train (plus 32-ton dynamometer car) on the level, whereas 1,000 to 2,000 drawbar horsepower was required to maintain this speed up a gradient of 1 in 200. Altogether, including the power expended by the locomotive in raising its own weight (in effect, in counteracting the force of gravity) and in overcoming its own resistance, there was a total expenditure of 1,750 h.p. Air pressure was an important contributor to loco-

motive resistance. Tests at the National Physical Laboratory had shown the power required to overcome it at various speeds with standard and streamlined L.N.E.R. Pacifics. At 80 and 90 m.p.h. respectively, between which limits lay the average speed of the Silver Jubilee up hill and down, making allowance for starting, stopping, and speed restrictions, there were savings of 96.9 h.p. and 138.09 h.p. in favour of the streamlined engine. These figures were for still air, but the probable average saving of power under service conditions remained considerably in excess of 100 h.p.

The average drawbar horsepower required on the London-Newcastle run of the Silver Jubilee had been shown by dynamometer car tests to be 620. Air and internal resistances of the locomotive at 80 m.p.h. would call for about another 450 h.p. with a standard Pacific, but only for 330 h.p.—a saving of about 10 per cent.—with the streamlined engine. Taking the economy in coal consumption as proportional to that in horsepower, the average of 39 lb. per mile consumed on the Silver Jubilee run represented a saving of about 4 lb. per mile, or over 200 tons a year.

The President then referred to the recent experimental run with the Silver Jubilee between Newcastle and Edinburgh, on which the minimum speed with 252 tons up the long 1 in 96 of Cockburnspath bank was 68 m.p.h. The actual drawbar horsepower here was 1,460, and allowing for the effect of gravity on the 166-ton engine, its internal and air resistance, the actual power output was between 2,500 and 2,600 h.p., a figure never previously attained in Great Britain.

If the popularity of high speed services made necessary the running of longer and heavier trains to schedules such as those of the Silver Jubilee, the provision of adequate locomotive power would be no insuperable obstacle. What did stand in the way of a more general speeding up, however, was the slow running, loose coupled, goods train, which made it hard to find paths for high speed trains, and was a potential source of delay which might nullify their value. The estimated cost of adapting the 1½ million British wagons (including about 700,000 privately owned) for faster running by equipping them with continuous brakes was £30 million. Here again, as far as locomotives were concerned, the means of acceleration was at hand. Credit was due to the late Mr. G. J. Churchward, of the Great Western Railway, for designing the first British express goods engines—his 2-6-0's of 1911.

The President concluded by urging the desirability of providing a locomotive testing plant in Great Britain, equipped on the lines suggested by experience at Vitry and in America. The cost of building and fitting out such a station was estimated at £150,000, and he was hopeful that a scheme to erect such a plant would soon materialise.

Institution of Railway Signal Engineers: Annual Dinner

The 16th annual dinner of the Institution of Railway Signal Engineers was held in London on Wednesday, October 21, under the chairmanship of the President of the Institution, Mr. W. S. Roberts, Managing Director, the Railway Signal Co. Ltd. He was supported by:—

Mr. H. M. Proud, Vice-President; Messrs. W. S. Every, A. F. Bound, H. E. Morgan, R. S. Griffiths, C. Carslake, W. Challis, W. Wood and F. Downes, Past-Presidents; Messrs. F. Horler, A. Oldham, F. L. Castle, J. Boot, H. H. Dyer, R. Falshaw Morkill, C. H. Hills, G. H. Crook, and A. Moss, Members of Council; Mr. M. G. Tweedie, Honorary Secretary; and Mr. T. S. Lascelles, Honorary Treasurer.

The guests of the institution were Mr. J. P. Wardle, Director of the Yeoward Line Ltd., Liverpool; Herr Kristensen, Chief Signal Engineer, and Herr Gronbaek, Assistant Signal Engineer, Danish State Railways. Among those who attended were Mr. Frank Potter, Superintendent of the Line, Great Western Railway, and Mr. K. C. Marrian, Resident Engineer, Cheshire Lines. There were about 160 present, including ladies. The speeches were commendably brief. Mr. H. M. Proud, Vice-President, proposed, after the loyal toast had been honoured, "The Institution." He abstained from referring to its technical activities and dwelt on the social side of its work, on the tie it formed between workers in signal engineering at home and abroad, and the many close friendships which had sprung from that. It was a spirit of happiness and fellowship which animated them that evening. He coupled Mr. Roberts' name with the toast.

Mr. W. S. Roberts, responding, thanked the members for the cordial support received while in the chair of the institution, and the Dinner Committee for arranging matters so agreeably. Mr. R. S. Griffiths had assisted him most ably. He extended a hearty welcome to the visitors, among whom was Mr. Hamdy, of the Signal Department of the Egyptian State Railways. Greetings had been received from W. C. Acliff, Past President, and Capt. A. L. Price, formerly of the Palestine Railways.

Mr. F. L. Castle, Member of Council, proposed "the Visitors," whom they were so gratified to have with them, and Mr. J. P. Wardle replied in an amusing speech, referring to the versatility of Mr. Roberts and stressing the value of the signal engineer's work and the debt incurred by the travelling public, who mostly had little conception of how safe railway working was ensured.

Herr Kristensen thanked the institution for inviting him and his colleague, and quoted from an interesting report made over 50 years ago by a Danish engineer, in which the completeness of the British signalling arrangements was even then remarked on, although there was a great deal of diversity in them.

Since then much progress had been made and standardisation had been achieved in many directions. This was in great measure due to the institution, which brought the signalling profession together in a most valuable way.

Mr. H. H. Dyer, Member of Council, proposed "The Overseas Members." Although he had not been able to travel, as others in the institution had done, he was closely associated with many overseas members, as they had been fellow students with him. Much of their work was, if not in extent at least in technical detail, of the most up-to-date description.

Mr. E. W. Baker, Signal Engineer, Assam Bengal Railway, in reply, said the institution was of special value to

those working overseas, the *Proceedings* being a great help to them. When they were at home on leave they found the meetings equally so. Conditions overseas were very diverse. There were some lines, such as the G.I.P. main electrified route, where the latest practice was to be seen, including colour-light signalling, equal to anything in Great Britain. On others, where traffic was different, very simple working sufficed. Overseas, the weather conditions were often vastly different and gave rise to peculiar technical problems that had to be solved in their own way. The Indian lines endeavoured to live up to British traditions in signalling and sound operating principles.

The dinner was followed by a dance, with music provided, by permission, by an orchestra from the L.N.E.R. Musical Society. Mr. C. H. Hills, Member of Council, acted as M.C.

Anglo-Argentine Dinner

Visit of the Argentine Minister of Foreign Affairs

His Excellency Dr. Don Carlos Saavedra Lamas, Minister of Foreign Affairs of the Argentine Republic, who has been on a short visit to London, attended a banquet on Tuesday at the May Fair Hotel, given in his honour by the principal financial and commercial institutions interested in Anglo-Argentine enterprise. Members of the Government and others of distinction in public affairs attended.

Mr. Alfred Mildmay, Managing Director of Baring Brothers & Co. Ltd., presided, and proposed the toast of "The Minister of Foreign Affairs of the Argentine Republic" and His Excellency replied.

Dr. Lamas spoke in Spanish, and in the course of his speech said that the friendly relations which had so long existed between Great Britain and Argentina had been in many ways fruitful, and were rare for their stability in this changing world. The cordial ties between them had developed in a century of unceasing evolution. His country placed at the disposal of Britain the fertility of her fields, her magnificent climate, the protection of her free institutions. Britain sent to his country her capital, the stimulus of her industries, and the example of her commercial scrupulousness. In investing sums which exceeded those placed in any other country in the world, Britain gave proof of her confidence in his country, and his country responded with complete integrity.

Sir Follett Holt proposed the toast of "The Guests" which was responded to by the Argentine Ambassador, H. E. Senor Don Manuel E. Malbrain, G.B.E., and the Rt. Hon. Walter Elliot, M.P., Minister of Agriculture.

Those present at the banquet numbered 217 and among those representing

British-owned railways in Argentina and other associated interests were:—

Sir Charles Barrie, K.B.E., D.L., J.P., M.P. (Director, Central Argentine Railway); Sir Eastman Bell, Bt. (Director, Buenos Ayres Great Southern & Western Railways); Messrs. B. H. Binder (Director, Argentine North Eastern and Entre Rios Railways, &c.); A. W. Bolden (Chairman, Antofagasta (Chili) and Bolivia Railway); A. J. Boyd (Managing Director, Metropolitan Cammell Carriage & Wagon Co. Ltd.); Hon. Eric B. Butler-Henderson (Director, Buenos Ayres Great Southern and Western Railways, &c.); Messrs. George Cocollis (Asst. Secretary, Central Argentine Railway); J. M. Eddy, C.B.E. (Director, Buenos Ayres & Pacific, and Buenos Ayres Great Southern Railways); Sir Sam Fay (Director, Buenos Ayres Great Southern and Western Railways); Messrs. Robert Graham (Secretary, British Argentine Railways Committee); N. F. E. Grey (Secretary, Buenos Ayres Great Southern and Buenos Ayres Western Railways); Lt.-Col. R. T. Harper, O.B.E. (Director, Buenos Ayres Western Railway); Messrs. G. H. Harrison, C.M.G. (Director, Argentine North Eastern Railway, Cordoba Central Railway, &c.); Hon. Philip Henderson and Mr. Neil B. Henderson (Livesey & Henderson, Consulting Engineers); Sir Follett Holt, K.B.E. (Chairman, Entre Rios, B.A. Great Southern and Western Railways, &c.); Messrs. W. Howard-Williams, C.B.E. (Chairman, Central Argentine Railway); Ronald Leslie (London Manager and Secretary, Central Argentine Railway); H. J. S. Moyes (Managing Director, Birmingham Railway Carriage & Wagon Co. Ltd.); Walter W. Parish (Chairman, Chubut Central Railway, &c.); Lt.-Col. Woodbine Parish, C.M.G., C.B.E. (Director, Buenos Ayres Great Southern and Western Railways, &c.); Rt. Hon. Lord Plender, G.B.E. (Deloitte, Plender Griffiths & Co.); Messrs. C. E. Rich (Secretary, Buenos Ayres & Pacific Railway); Tom L. Taylor (Director, Geo. Spencer Moulton & Co., Metropolitan Cammell Carriage & Wagon Co. Ltd., &c.); F. S. Whalley, M.C. (Managing Director, Vulcan Foundry Limited); W. Cyril Williams (London Manager, Beyer Peacock & Co. Ltd.).

BICYCLE AND MOTOR CYCLE SHOW AT OLYMPIA.—In connection with the Bicycle and Motor Cycle Show from November 2 to 7, at the Olympia, London, the G.W.R. is giving day trip bookings from all parts of its system.

RAILWAY AND OTHER MEETINGS

South Indian Railway Co. Ltd.

The annual general meeting of the South Indian Railway Co. Ltd. was held at 91, Petty France, Westminster, on October 28, Sir Ernest A. S. Bell, C.I.E., Chairman and Managing Director, presiding. The Assistant to the Managing Director (Mr. C. A. Worsfold) read the notice convening the meeting and the auditors' report.

The Chairman, in moving the adoption of the report and accounts, said that with reference to road competition the measure proposed by the Transport Advisory Council to secure a fair deal as between railways and roads embodied restrictions on the use of road vehicles. Unfortunately practically all these proposals were criticised by one or other of the provincial governments, whose immediate interests lay more in the direction of expansion of road traffic than its curtailment, as road licences formed one of the sources of provincial revenues.

Referring to the Indian Financial Enquiry Report by Sir Otto Niemeyer, and the subsequent appointment of the committee consisting of Sir Ralph Wedgwood, and Mr. W. A. Stanier, the Chairman said that the task of examining the position of the Indian state-owned railways was a very difficult one. He was sure, however, that any recommendations by such eminent experts would be of great value. The Indian railways, he considered, had most to learn on their commercial side.

The two largest works which the railway had carried out in recent years were the new workshops at Golden Rock and the Madras electrification. When these works were considered the directors had had no doubt that both would show a satisfactory return on the large capital expenditure necessitated thereby. The Cochin harbour scheme had now been approved.

Even before the advent of bus competition the South Indian administration had realised the possibilities of railcars to cope with short distance passenger traffic, and for some years now it had had three such cars which had given good service. One of these had recently been converted from a petrol engine drive into a diesel engine drive, the results of which in the reduction of operating costs and improvement in the services rendered to the public had been so satisfactory that it had been decided to convert the remaining two. The Railway Board had also agreed to the company's proposal to provide eight additional diesel railcars—four for the broad gauge and four for the metre gauge.

Proceeding, the Chairman said that his colleague, Sir Percy Rothera, and Mr. Bruce White, the senior partner in the firm of Robert White & Partners, Consulting Engineers to the company, were shortly proceeding to India on a visit of inspection of the

South Indian Railway system. He then turned to consideration of the report and accounts. The year had been the worst in the history of the company, due mainly to the economic depression in South India consequent upon the failure of three monsoons in succession. The capital outlay on the open line during the year amounted to Rs. 14.93 lakhs. The short line of 5.6 miles from Agastiyampalli to Point Calimere had been opened on January 20 last, and the capital expenditure thereon during the year amounted to Rs. 2.85 lakhs. There was a decrease of Rs. 25.94 lakhs in gross earnings, of which 22 lakhs was due to passenger traffic. Owing to continued bus competition and to the poverty of the people, due to the low prices of their products, 4,382,000 fewer passengers had been carried. There was a small

decrease in goods earnings also, though 5,600 tons more public merchandise was carried. The remainder of the decrease was due to lower steamboat earnings and less under telegraph and sundries.

Working expenses increased by just over Rs. 12 lakhs, ordinary working expenses accounting for nearly 3½ lakhs and renewals and replacements for just over 8½ lakhs. The increase in ordinary working expenses was almost entirely due to the restoration of the pay cuts. The ratio of working expenses to gross earnings was 62.78 per cent., as against 57.17 per cent. last year. The net earnings, after certain adjustments, were Rs. 1,84,36,922 or nearly Rs. 34½ lakhs less than the previous year. The board regretted having again to recommend a reduction in the year's dividend from 6½ per cent. to 5½ per cent., to pay which it would have to draw some £9,900 from surplus profits account.

The report and accounts were unanimously adopted.

Buenos Ayres Great Southern Railway Co. Ltd.

The ordinary general meeting of the Buenos Ayres Great Southern Railway Co. Ltd. was held at River Plate House, Finsbury Circus, E.C.2, on October 28, Sir Follett Holt, K.B.E., Chairman of the company, presiding.

The Secretary (Mr. N. F. E. Grey) read the notice convening the meeting and the auditors' report.

The Chairman preceded his review of the company's operations by referring to the loss the company and all the members of the board had recently suffered by the passing of Sir Brodie Henderson, head of the company's firm of consulting engineers. Eminent as an engineer, he had been for many years of great help in dealing with the engineering and transport problems of the company. The Chairman, on his last two visits to Argentina, had been accompanied by Sir Brodie Henderson, who had proved himself then as always a good companion, full of knowledge and understanding, and entirely devoted to the company's interests.

In moving the adoption of the report and accounts, the Chairman said that the railway had suffered not only from exchange and other difficulties, but from poor crops, caused by drought, which brought a direct loss in revenue of over £1 million, and reduced purchasing power in the company's zone. Fortunately part of this heavy loss was made up by traffic improvements connected with other industries. Livestock, especially, showed an increase of £177,000 and constituted in numbers a record for the railway. Fortunately also, both exchange losses and working expenses were less, but after charging the renewal expenditure of the year to the renewal fund, it was still found, after

meeting fixed charges, that the disposable balance in revenue account was lower by £487,000, which was the reason why it had been necessary to cut down the sum allocated to preference dividends to an almost negligible figure.

The fact that the railway had done practically the same work as in the previous year but had received 8.8 per cent. less for doing it, reflected the effect of road competition on the company's rates. Substantial reductions in expenses had been partially offset by essential maintenance of the locomotive stock which had replaced obsolete types between 1926 and 1932. The plan to combine the management of the Southern and Western companies had not only arrested the growth of overhead and operating expenses, but had even lowered them.

Many changes had occurred in the company's organisation during the year. After giving a long, faithful and good service Mr. Stuart and Mr. Roberts had retired from the management on pension, and Major Loewenthal, who had won distinction in the railway world, had joined the Southern and Western as Manager. Mr. Harris had completed his first year of strenuous work in the direction of the company's affairs with marked success.

Thirty-nine per cent. of the company's annual expenditure, or £2,854,000, was claimed by locomotive traction and maintenance, so that there was ample scope for the economy that might be secured with diesel traction. The company was contemplating replacement of or additions to its steam locomotive stock with diesel units, and orders had been placed for four more main-line diesel locomotives and seven-

teen diesel passenger cars for service on branch lines, and on the Midland system. Fuel oil could well be supplied from the field at Rivadavia, which the company held in shares with the Western and the Pacific systems. Last year the company had used 70,000 tons of oil from Rivadavia. Income from its investment in the field had increased from £59,000 to £69,000.

The British-owned railways in Argentina had now formed an organisation to safeguard the welfare as far as was humanly possible by co-operative effort of the £275,000,000 invested in the 10,000 miles of railway in that country. It was represented in London by the four Chairmen of the seven railways or systems, with Mr. Graham, who was Secretary of the Southern and Western, as Secretary. The company had confidence that this all-important step towards centralising effort would redound to the well-being of the industry.

Leaving all other problems aside, the Chairman asked shareholders to consider what the exchange situation had meant to the company. Depreciation of the peso three years ago had represented a loss to net revenue of $37\frac{1}{2}$ per cent. Had the old rate remained, the company would have been able even in the past bad crop year to cover all preference charges, and to pay 1 per cent. on the ordinary stock. The Chairman considered, however, that in the immediate future the course of exchange would be more rather than less favourable. The company was much indebted to the efforts in Argentina of Mr. Eddy, who, in co-operation with Mr. Howard-Williams of the Central Argentine and Mr. Goudge of the B.A. & Pacific Railways, had secured exchange for the companies at a rate 7.46 per cent. better for the calendar year. A condition was that a rebate should be granted in the maize tariff, but on balance the exchange concession had been of good assistance.

The Argentine authorities had submitted to Congress a pooling bill designed to enable the railway companies to make domestic combinations and so obtain more efficient results. When this bill became law, the Government Executive would be empowered, *inter alia*, to authorise railway amalgamations where these could be shown to be in the general interests, and the company would then hope that the present very close association with the Western would be even further extended. Pooling of wagons had also been authorised.

With a normal cereal crop this year, and higher values, Argentina should return to a state of prosperity in which all the railways would share. The company was fortunate in serving a fertile area which could and in time would, produce twice as much and support twice as large a population as now. A message from the General Manager stated that prospects as a whole were exceedingly promising.

The report and accounts were unanimously adopted.

Buenos Ayres & Pacific Railway Co. Ltd.

The annual general meeting of the Buenos Ayres & Pacific Railway Co. Ltd. was held at Winchester House, Old Broad Street, London, on October 29, the Viscount St. Davids, Chairman of the company, presiding.

The Secretary (Mr. C. E. Rich) read the notice convening the meeting and the auditors' report.

The Chairman, in moving the adoption of the report and accounts, said the fact that the company, in earning £300,000 more gross receipts, had incurred £508,000 higher working expenses might not look like a good result; but when it was known that the working expenses included £168,000 for increased wages in accordance with the President's decree, and £326,000 for special renewals, it would be seen that the extra sum involved in earning £300,000 more was actually £14,000. During the year the company had cleared off all the arrears of interest on the second debentures of the Pacific, and Argentine Great Western Railways, and had paid the holders 5 per cent. interest on those arrears. The stocks ranking next for interest were the Pacific $4\frac{1}{2}$ per cent. consolidated debentures and the Argentine Great Western 5 per cent. debentures; the company would be able to pay one half-year's arrears on both on December 1.

A more favourable rate of exchange was enjoyed during the present calendar year as a result of negotiations carried on by two of the directors, Mr. J. A. Goudge and Mr. J. M. Eddy. Both the President of the Republic and the Minister of Finance had realised the heavy burden laid upon the railway by exchange, and had made a serious effort to reduce the companies' losses. A special rate for maize had been granted in return for the concession. The matter of competitive Government lines had also been discussed, and it was satisfactory to report that an agreement had been arrived at which should place competition on regulated lines, with fair conditions for both parties, and to the benefit of the public.

Another work of the four great Argentine railways had been the formation of a committee which would in future deal with all matters involving common action both here and in Argentina. An arrangement had been arrived at with the French railways by which they were kept advised of the British companies' proceedings, and it was hoped that they might eventually become members of the committee.

A pleasing feature was the success of the oil concern in which the company was a shareholder. The life of the field was estimated to be a further 15 years (the same period as had been suggested 15 years ago, when the company took its shares in the venture). It was a highly successful enterprise. New business for the railway might be expected from the establishment of factories for manufacturing tartaric in Mendoza, and the working of a luminous phosphate

deposit from which it was hoped to produce 100,000 tons in a five-year period.

Among the increased traffics was that in fresh fruit, which improved by 12,000 tons. South American Hotels, a small subsidiary of the company which sold fruit at a moderate rate, had last year disposed of 350,000 boxes, compared with 260,000 the year before. It was clear that the Cuyo provinces, served by the railway, were destined to be the great fruit district of Argentina. The population of these provinces continued to increase, and the population of Argentina as a whole had risen by 168,000 in the course of 1934. However badly the railways might be doing at any given moment, a steady growth of population was bound in the long run to act as a great lever to the well-being of the railways. General business conditions were flourishing, and the values of all products well maintained and increasing.

Although there had been less wheat and maize at the company's stations on June 1 than a year ago, since then the traffic had held its own. The crop position was better, and there was an increase of 49 per cent. in the area under cultivation. Given an increased wheat crop and absence of adverse weather, the results for the present year should be at least as good as those now submitted.

The report and accounts were unanimously adopted.

Railway and other Reports

Bahia Blanca & North Western Railway.—The report states that the guaranteed rental of £440,000 due from the Buenos Ayres Great Southern Railway Company in respect of the year ended June 30, 1936, has been received and the dividend on the guaranteed stock has been duly paid.

Bombay, Baroda & Central India Railway.—The directors, at their meeting on October 28, authorised the payment in January next, in addition to the half year's guaranteed interest of £1 10s. per cent., of an interim dividend of £1 10s. per cent., in respect of the company's profits for the financial year 1936-37.

Bengal Doonars Railway.—Gross earnings for the year ended March 31, 1936, amounted to Rs. 18,53,550, a decrease of Rs. 2,03,461 in comparison with the previous year. In the working expenses of Rs. 11,72,434 there was a reduction of Rs. 15,964, leaving net earnings Rs. 1,87,497 lower, at Rs. 6,81,116. Net earnings in sterling (less Indian taxation) amounted to £43,278, against £57,569. The directors have placed £10,000 to the credit of the reserve fund, bringing it up to £365,000, and recommend a final dividend of 3 per cent., making a total distribution of 6 per cent. for the year.

NOTES AND NEWS

Leek & Manifold Valley Light Railway.—Consequent upon prolonged negotiations between the L.M.S.R. and various local authorities, the railway company has offered the disused track of the Leek & Manifold Valley Light Railway as a gift to the Staffordshire County Council for permanent use as a public footpath. The matter was referred to editorially in our issue of September 11 last.

New North Eastern Airways Service.—On November 2, North Eastern Airways Limited will inaugurate a service on alternate days between London (Croydon), Doncaster, Leeds and Bradford, Newcastle-on-Tyne, and Perth. Planes will fly northwards on Mondays, Wednesdays, and Fridays, and southwards on Tuesdays, Thursdays, and Saturdays. The flying time for the journey from London to Perth will be 3 hr. 20 min.

Severn Bridge Scheme.—At a conference of representatives of 39 local authorities in South Wales and the West of England and of other interests held at Cardiff on Tuesday, October 27, resolutions were adopted by a large majority urging that a road bridge across the River Severn was desirable in the national interest; that the Government should accept financial responsibility for the work; and that a deputation of representatives of local authorities and industrial and commercial interests should approach the Government to provide facilities for the undertaking.

Refrigerating Flowers for Rail Transit.—Experiments in the refrigeration of cut flowers, to keep them fresh on long railway journeys, are being conducted by the L.M.S.R. These consist of loading the flowers in a van fitted with a container of Drikold (solid carbon dioxide), or of placing a small quantity of this refrigerant in the boxes in which the flowers are packed. Flowers treated in this way have been conveyed from the East Anglian flower grounds to London, and in other instances to important flower shows, and on arrival have been found to be in a fresher state than under ordinary conditions. So far, however, the experiments have not been wholly conclusive as to the best method of applying the refrigerant, and L.M.S.R. research experts are still working on the problem.

South London Tube Extension Requests.—Lord Ashfield, in his capacity as Chairman of the Standing Joint Committee of the London Passenger Transport Board and the main line railway companies, received, on Monday, October 26, a deputation of representatives of the Camberwell and Southwark Borough Councils and of the Camberwell, Peckham, and Dulwich Chamber of Commerce, who urged the extension of the Bakerloo Railway from Elephant

and Castle to Camberwell Green. Lord Ashfield was of opinion that the railway ought to be built, but he doubted whether it would be self-supporting. Owing to difficulties of construction, the 1½ miles, together with an extension a little beyond Camberwell Green to provide space for storage, would cost £2,000,000. He promised that he would take an early opportunity of discussing the subject with his colleagues on the standing joint committee and that a prompt reply would be sent to the deputation.

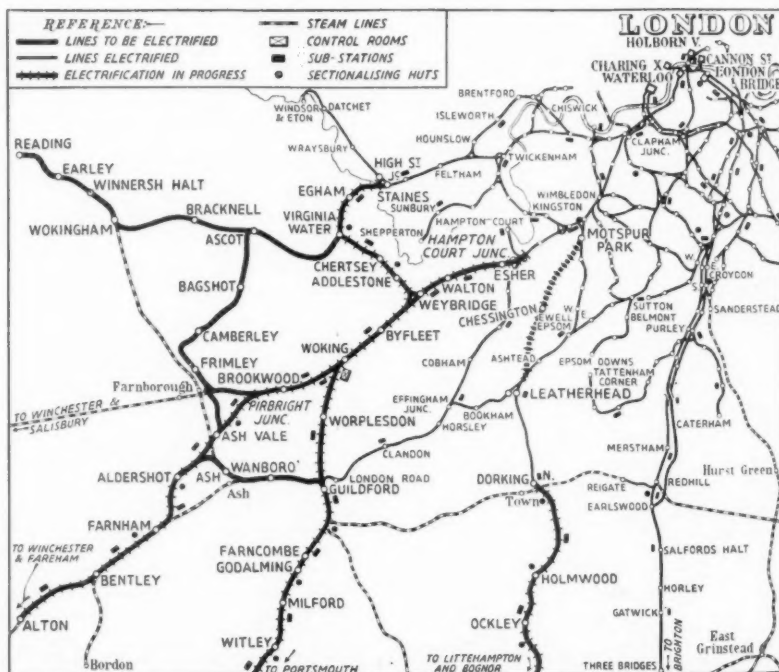
L.M.S.R. Directors Honour Mr. Harris.—In connection with the retirement of Mr. A. C. Harris, Assistant in the Central Office and Principal Welfare Officer, L.M.S.R., recorded in our issue of October 23, and referred to on page 708 this week, Sir Josiah Stamp, G.C.B. G.B.E. (Chairman), Mr. E. B. Fielden, M.P. (Deputy Chairman), Sir Thomas Williams and Mr. G. R. T. Taylor, Directors of the company, created a precedent when they associated themselves with a presentation made by the Vice-Presidents and Chief Officers of the L.M.S.R. to Mr. Harris. The presentation was made by Sir Josiah Stamp, and consisted of a hand-made reproduction of a Georgian silver salver and cream ewer bearing the Silver Jubilee mark; the salver is inscribed with the names of the subscribers. The presentation was made as an unique memorial of the many personal services Mr. Harris has rendered to the directors

and chief officers during his long period of service.

Other Presentations to Mr. Harris.—Other presentations to Mr. Harris are being made: (1) by the office staff of the Chief Officer for Labour and Establishment, including the Welfare Department, (2) by the office of the President of the Executive, pass section, and (3) by the central office at Euston.

More London Escalators to have Empire Woods.—Empire woods will be used in the construction of the next four sets of escalators for London Transport. The five new escalators at King's Cross will have panels of Queensland walnut, and five escalators now being built at Post Office station will be panelled with Indian laurel. Plain bubinga from South Africa and Australian silky oak will be used on two other sets of escalators to be selected. The decision follows an experiment at Moorgate station where an escalator was fitted with a number of test panels of Empire woods. London Transport hopes that greater interest will be stimulated in the fine woods of the Dominions and the Colonies.

"The Last of Mr. Cheyney."—On Friday and Saturday of last week, the L.M.S.R. (London) Amateur Dramatic Society presented at the Cripplegate Theatre, Frederick Lonsdale's well-known three-act play, "The Last of Mrs. Cheyney." The production was in the hands of Mr. W. F. Humphreys and ably maintained the reputation that the society has earned during the past three years with its performances at this theatre. Membership of the



Map showing the recently authorised additional 43 miles of Southern Railway route to be electrified. Details were given on page 678 last week

Society is open to all L.M.S.R. staff, past and present, and also to the wives, sons, and daughters of members of the staff. Last week the title rôle was in the capable hands of Mrs. K. Myrra Barrie, who included among her accomplishments a pleasant rendering of the piano interludes called for by the book. The leading male parts were acted with skill and conviction by Mr. Jack Pegg as "Charles, a butler," and Mr. Arthur E. Lloyd as "Lord Dilling." They were well supported by the other members of a happily chosen caste totalling fourteen characters. The Stage Manager was Mr. W. W. Sharp, and the Assistant Stage Manager, Mr. E. G. Savage.

Air Line Fares Lower than Express Passenger Train Fares in America.—From November 1, Transcontinental and Western Air Lines fares will be lower than those of "extra-fare" trains, states a Reuters message. These air line fares will be in force during the winter only to counteract seasonal decline in aerial traffic at that

time of year. New York-Chicago fares will be \$33.96, or \$6.97 less than those by crack express trains, and within 71 cents of the regular train fare. The time scheduled is 4½ hr. as against 16½ to 20 hr. by rail. The fares from New York to Los Angeles and San Francisco will be \$118.96, several dollars under the fares by the fast trains, and the journey will take 17 as against 80 hr.

Road Accidents.—The Ministry of Transport return for the week ended October 24 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding period of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England	131	(109)	4,122	(3,564)
Wales	5	(2)	173	(140)
Scotland	16	(11)	460	(283)
	152	(122)	4,755	(3,987)

The total fatalities for the previous week were 121, compared with 141 for the corresponding period of last year.

British and Irish Railways Stocks and Shares

Stocks	Highest 1935	Lowest 1935	Prices	
			Oct. 24, 1936	Rise Fall
G.W.R.				
Cons. Ord. ...	55½	44½	58¾	—1¼
5% Con. Prefce ...	124	108	125	+1
5% Red. Pref. (1950) ...	117	106¾	110½	—
4% Deb. ...	118½	108	117	—
4½% Deb. ...	122	110	120½	—
4½% Deb. ...	129½	118	127½	—
5% Deb. ...	140½	130	138½	—
2½% Deb. ...	82¼	68½	76½	—
5% Rt. Charge ...	137	128	135½	—
5% Cons. Guar. ...	136¾	120½	133½	—
L.M.S.R.				
Ord. ...	25½	16	30½	+1
4% Prefce. (1923) ...	58¼	43½	79	—
4% Prefce. ...	87½	73½	90	—
5% Red. Pref. (1955) ...	107	97¾	108½	—
4% Deb. ...	110½	99½	110½	—
5% Red. Deb. (1952) ...	119½	111½	115½*	—
4% Guar. ...	105½	95½	105½	—
L.N.E.R.				
5% Pref. Ord. ...	157½	8¼	12	—½
Def. Ord. ...	79½	4¾	6¼	—
4% First Prefce. ...	74¾	48	78	—
4% Second Prefce. ...	31¾	16¼	30	—1
5% Red. Pref. (1955) ...	92¼	71	98	—
4% First Guar. ...	103½	93	102½	—½
4% Second Guar. ...	98¾	82½	98½	—
3% Deb. ...	86	75	84	—
4% Deb. ...	109¼	98½	108½	—
5% Red. Deb. (1947) ...	118¼	106½	112½	—
4½% Sinking Fund Red. Deb. ...	112½	108	110½	—
SOUTHERN				
Pref. Ord. ...	87½	69¾	97	—
Def. Ord. ...	25½	16¾	26	—
5% Prefce. ...	124	108¼	125	+½
5% Red. Pref. (1964) ...	117¾	109½	117½	—
5% Guar. Prefce. ...	136½	121½	133½	—
5% Red. Guar. Pref. (1957) ...	121¼	112½	117½	—
4% Deb. ...	116¾	107	115	—
5% Deb. ...	138	130¼	137½	—
4% Red. Deb. 1962-67 ...	115	106½	112½	—
BELFAST & C.D.				
Ord. ...	9	4	4½	—
FORTH BRIDGE				
4% Deb. ...	111¼	104¼	105½	—
4% Guar. ...	109½	104	105½	—
G. NORTHERN (IRELAND)				
Ord. ...	20	7	13	+¼
G. SOUTHERN (IRELAND)				
Ord. ...	57½	14½	54	—
Prefce. ...	50	25¼	60½	+½
Guar. ...	88¾	51¼	89	+½
Deb. ...	86¼	70	97	+1¾
L.P.T.B.				
4½% "A" ...	130	119¾	126½	—
5% "A" ...	139¾	130	136½	—
4½% "T.F.A." ...	113¾	108	111	+½
5% "B" ...	131½	122¾	129½	+½
"C" ...	109½	91	101	—1
MERSEY				
Ord. ...	23½	9¼	38	—
4% Perp. Deb. ...	100½	93½	100	—
3% Perp. Deb. ...	75½	67	76½	—
3% Perp. Prefce. ...	62	47¼	67½	—

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 43rd Week			Totals to Date		
	1936	1935	Inc. or Dec.	1936	1935	Inc. or Dec.
L.M.S.R. (6,916½ mls.)						
Passenger-train traffic...	438,000	417,000	+ 21,000	21,802,000	21,293,000	+ 509,000
Merchandise, &c.	525,000	487,000	+ 38,000	20,470,000	19,318,000	+ 1,152,000
Coal and coke	242,000	253,000	— 11,000	10,225,000	9,789,000	+ 436,000
Goods-train traffic	767,000	740,000	+ 27,000	30,695,000	29,107,000	+ 1,588,000
Total receipts	1,205,000	1,157,000	+ 48,000	52,497,000	50,400,600	+ 2,097,000
L.N.E.R. (6,332 mls.)						
Passenger-train traffic...	286,000	276,000	+ 10,000	14,154,000	13,868,000	+ 286,000
Merchandise, &c.	368,000	368,000	—	13,872,000	13,381,000	+ 491,000
Coal and coke	246,000	247,000	— 1,000	9,913,000	9,463,000	+ 450,000
Goods-train traffic	614,000	615,000	— 1,000	23,785,000	22,844,000	+ 941,000
Total receipts	900,000	891,000	+ 9,000	37,939,000	36,712,000	+ 1,227,000
G.W.R. (3,746½ mls.)						
Passenger-train traffic...	192,000	179,000	+ 13,000	9,197,000	9,040,000	+ 157,000
Merchandise, &c.	209,000	204,000	+ 5,000	8,173,000	7,842,000	+ 331,000
Coal and coke	108,000	108,000	—	4,290,000	4,209,000	+ 81,000
Goods-train traffic	317,000	312,000	+ 5,000	12,463,000	12,051,000	+ 412,000
Total receipts	509,000	491,000	+ 18,000	21,660,000	21,091,000	+ 569,000
S.R. (2,153 mls.)						
Passenger-train traffic...	277,000	259,000	+ 18,000	13,455,000	13,213,000	+ 242,000
Merchandise, &c.	69,000	65,000	+ 4,000	2,697,000	2,656,500	+ 40,500
Coal and coke	32,000	32,000	—	1,316,000	1,263,500	+ 52,500
Goods-train traffic	101,000	97,000	+ 4,000	4,013,000	3,920,000	+ 93,000
Total receipts	378,000	356,000	+ 22,000	17,468,000	17,133,000	+ 335,000
Liverpool Overhead (6½ mls.)						
Mersey (4½ mls.)	1,157	1,139	+ 18	51,461	51,046	+ 415
*London Passenger Transport Board	4,295	4,067	+ 228	174,304	172,129	+ 2,175
	578,200	551,200	+ 27,000	9,512,500	9,228,300	+ 284,200
IRELAND						
Belfast & C.D. pass. (80 mls.)	1,688	1,851	— 163	113,891	112,308	+ 1,583
" " goods	561	555	+ 6	22,994	21,616	+ 1,378
" " total	2,249	2,406	— 157	136,885	133,924	+ 2,961
†Great Northern, pass. (543 mls.)	8,900	8,700	+ 200	471,050	450,850	+ 20,200
" " goods	10,650	10,600	+ 50	403,900	400,200	+ 3,700
" " total	19,550	19,300	+ 250	874,950	851,050	+ 23,900
†Great Southern, pass. (2,067 mls.)	30,030	27,944	+ 2,086	1,559,962	1,511,361	+ 48,601
" " goods	48,949	45,237	+ 3,712	1,753,131	1,638,047	+ 115,084
" " total	78,979	73,181	+ 5,798	3,313,093	3,149,408	+ 163,685

* 17th week.

† 42nd week.

* ex-dividend

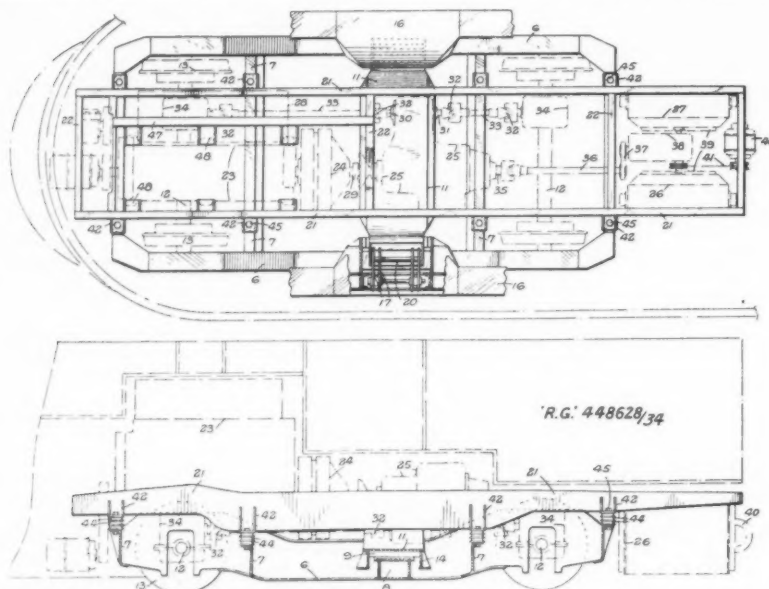
ABSTRACTS OF RECENT PATENTS*

No. 448,628. Railway Vehicle Bogies

The Birmingham Railway Carriage & Wagon Co. Ltd., of Smethwick, in the County of Stafford, and Norman Schofield, of 139, Sandwell Road, Handsworth, Birmingham, in the County of Warwick. (December 11, 1934.)

A bogie truck comprises a truck frame having side members 6 and transverse members 7 and 8, which sup-

ports the power unit and associated gearing, including the engine 23, clutch 24, gearbox 25, water and lubricant radiators 26 and 27. The clutch and gearbox are mounted behind the engine 23, the gearbox transferring the drive from the clutch shaft 29 to a pair of drive shafts 30 and 31. Each drive shaft is connected through universal joints 32 and transmission shafts 33 to differential gearing mounted in the casing 34 and driving the wheel axles 12. A further shaft 35 is connected



port a pivot 9 with which engages a further pivot 10 on a member 11 to which the body of the vehicle is connected. Each side member 6 is cranked so that its centre part is at a lower level than that of the end parts, at which are mounted the axles 12 for the wheels 13. The member 11 is mounted over the cross members 8 so that the side flanges 14 of the bolster can move to a limited extent relative to the truck frame and about the pivot 9. The bolster 11 is thus pivoted directly to the truck frame and has its ends extending upwardly and outwardly over the sides 6 of the frame, and each end of the bolster is supported on rubbing plates 15 secured one to the top of the side member, and the other to the underside of the end of the bolster. Coupling members 16 comprise brackets 17 of L shape mounted on and connected to spring carrying links 18 provided with springs 19 and engaging longitudinal bars 20 provided on the bolsters 11. A pair of longitudinal beams 21 connected by transverse members 22 sup-

through a universal joint to a shaft 36 having a belt drive 37 to gearing in a casing 38, this gearing driving a pair of fans 39, one for each of the radiators 26 and 27. The sub-frame of the detachable unit is bolted to the truck frame at four points, and the clamping bolts are passed through holes in brackets or flanges 42 secured to the outer sides of the bearers 21 and through holes in horizontal flanges 43 on the transverse members 7 of the truck frame. Shock absorbing means each comprising a number of rubber blocks 44 are threaded upon the clamping bolt 45 with intervening metal washers 46. The engine 23, which is supported from one bearer 21 and a further longitudinal bearer 47 secured across the transverse members 22, may be supported on resilient members if desired and may be mounted between lugs or brackets on the engine and brackets 48 secured to the bearers 24 and 27. The universal joints and the shaft extending into each differential gear housing are so constructed as to

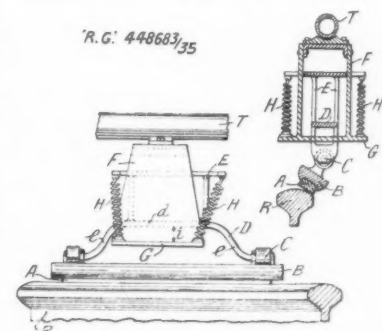
* These abridgments of recently published specifications are specially compiled for THE RAILWAY GAZETTE by permission of the Controller of His Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued, on payment of a subscription of 5s. a group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address price 1s. each.

be easily detachable, so that the whole unit including the power unit and associated gear mounted within the frame 21, 22 can readily be removed from the bogie truck when required, without disturbing any part of the bogie or the body spring suspension gear. The drive to each differential is disconnected at the universal joint and the whole power unit can then be removed.—(Accepted June 11, 1936.)

No. 448,683. Railway Track Signalling Systems

Michelin et Cie, of Clermont Ferrand, Puy de Dome, France. (Convention Date: March 5, 1935.)

A mounting for a sliding contact member comprises a strip A mounted in a shoe B. The mounting is detachable in order to permit simple and rapid replacement of the contact strip. The shoe B is connected to a support member D by silent bloc bushes C permitting its rotation about the axis X-Y and its transverse displacement with respect to the rail R. This member D has the form of an inverted U; the central part d is integral with a member E sliding in a housing F which carries a driving plate G upon which are fixed four spiral springs H connecting the housing F to the member E, and applying the contact strip A upon the rail R. The housing F is fixed rigidly to a tube T so that there exists between the plate G and the flat part d of the member D a certain interval i permitting the contact strip A to take up a suitable position in spite of wear. When at rest the strip A centres itself with respect to the driving plate and is connected to the vehicle solely by the four springs H. On starting, the driving plate G is applied against the support member D and entrains by its intermediary the shoe B and the contact strip A. The form of the curved parts e is so selected that the vertical reaction produced by this drive relieves



the front of the contact member, and thus ensures regular wear. The shoe B is guided parallel to the rail by the member E which can be displaced in the housing F only in a direction parallel to the rail. When the contact member strikes against a rail joint, e.g., when passing over points, the member D rises along the plate G by the cam action of one of its slopes e

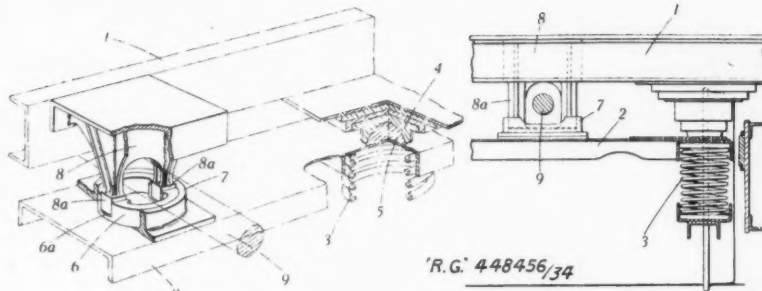
7 is
10 s
off
sprin
co-o
valv
app
exp
thus
grad

and raises the front of the shoe B, which ensures the correct passage of the joint. Upon passage over a point system, the silent bloc joints C permit the shoe B to take up an oblique position with respect to the rail, and to bring the shoe back perpendicular to the rail upon leaving the points.—
(Accepted June 12, 1936.)

No. 449,055. Steam Heating Apparatus for Railway Vehicles

Thomas Barty, and Westinghouse Brake & Signal Co. Ltd., both of 82, York Road, King's Cross, London, N.1. (July 22, 1935.)

In a heater, the body comprises two tubes 1 arranged side by side and connected together at each end by headers 2 and 3, the header 2 being provided with a drain 4 and the header 3 being provided with steam inlet port 5. The tubes 1 may be provided with gills 6, or they may be plain tubes. An external rod 7 with an extension 7' runs between and parallel with the tubes 1, and is secured at one end 8 in an aperture in a bracket member 9 integral with the header 2, this end 8 of the rod being screw-threaded and provided with nuts 10 at each side of the bracket in order to permit initial adjustment of the rod. The extension 7' of the rod passes through an aperture in the inner wall 11 of the header 3. A suitable packing 12 is provided within the aperture and surrounds the extension 7', which co-operates with the stem 13 of a valve element 14 having its seat surrounding the steam inlet port 5. When the body of the heater is cold, the rod



'R.G.' 448456/34

whole apparatus is secured to the floor, beneath the seat, by means of brackets 16 and 17 secured to the headers 2 and 3 so that the apparatus will be raised slightly from the floor and will tend to slope downwards towards the drain 4.
(Accepted June 19, 1936.)

No. 448,456. Bogies for Railway Vehicles

Sir W. G. Armstrong-Whitworth & Co. Ltd., and George Pawson, both of Scotswood Works, in the City and County of Newcastle-on-Tyne, England. (December 7, 1934.)

A bogie comprises an underframe 1, and a spring bolster 2 supported by springs 3 and resting on the bogie frame, while 4 and 5 are load carrying side bearers. A horizontal ring 6 is located in a hollow boss 7, rigidly secured to the bolster 2. The ring has two diametrically opposite slots 6a cut in its upper portion, in which slots engage the feet 8a of an arch-shaped structure 8 rigidly secured to the transverse underframe member 1. The feet

is located at right angles to the axis of the obstruction it is desired to avoid, in this case a transmission shaft 9. The horizontal ring 6 is located with a slight clearance in the boss, whilst its lower face is spherical. This permits of relative movement between the ring 6 and the boss 7 in order to accommodate the relative displacement between the bogie frame and the underframe 1, due to the vehicle entering an incline or to braking or driving reactions.—
(Accepted June 8, 1936.)

COMPLETE SPECIFICATIONS ACCEPTED

447,681. Stevens, A. H. (Ryan Car Company). Railway draft vehicles or self-propelled railway cars

447,703. Kershaw, A. G., and Westinghouse Brake & Signal Co. Ltd. Trailable point-operating mechanism for railways and the like

447,727. Westinghouse Brake & Signal Co. Ltd. Braking apparatus for railway and other vehicles

447,866. Standard Telephones & Cables Limited, Griffiths, J. B., and Brown, A. Railway and like signalling systems

447,892. Rüping, M. Means for fastening railway rail chairs to sleepers

448,172. Ingvarsson, I. Tip-wagons

448,261. Ellis, G. B. Cooling device for the brake drums of vehicles, suitable for rail vehicles

448,416. Oxweld Railroad Service Company. Surface hardening of rails, and rails treated thereby

448,493. Oxweld Railroad Service Company. Rails having end tread surface areas hardened by heat treatment

448,518. Devlin, S. R. Couplings for railway and other carriages and wagons

448,588. Siemens Schuckertwerke A.G. Electrical brake-pressure regulators for railway vehicles

448,734. Vereinigte Eisenbahn-Signal-Werke Ges. Point-operating systems, more particularly, but not essentially, for railway sidings

448,841. Quilliam, L., and Forest City Electric Co. Ltd. Apparatus for electrically operating railway and tramway points and for analogous purposes

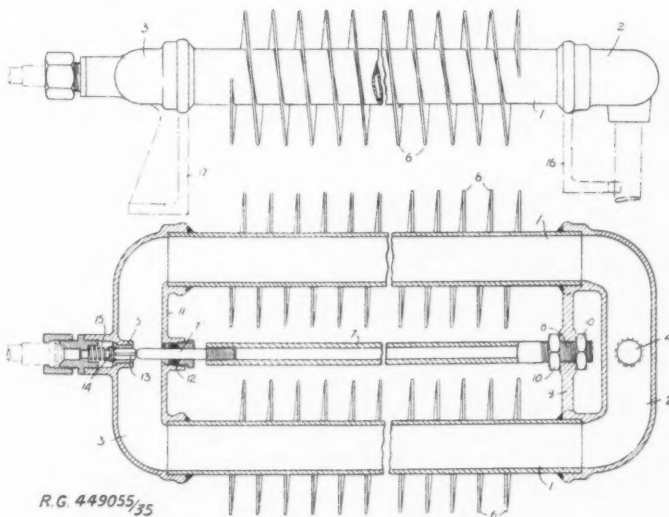
448,858. Livsey, D. M. (Waylen, D. C.). Brake apparatus for railway and like vehicles

448,876. Scharfenbergkupplung A.G. Automatic coupling for vehicles

449,346. Superheater Co. Ltd. Steam superheaters for locomotive or like smoke tube boilers

449,492. Lentz, H. Reconstruction of locomotives

449,493. Lentz, H. Reconstruction of locomotives



R.G. 449055/35

7 is adjusted by means of the two nuts 10 so that the valve element 14 is held off its seat against the action of a spring 15 by the extremity of the rod co-operating with the stem 13 of the valve. When steam is supplied to the apparatus, the body of the heater, in expanding, carries with it the rod 7, thus permitting the inlet valve 14 to be gradually seated by the spring 15. The

8a of the structure 8 are constructed so that they may be inserted into the slots in the horizontal ring 6 by the vertical movement, while their outer faces correspond with the curvature of the ring 6. The underfaces of the feet are finished so as to leave a clearance from the bottom of the diametral grooves 6a when they are inserted in their normal position. The member 8

G.W.R. Ambulance Work, 1935-6

The Great Western Railway ambulance movement has made consistent progress during the twelve months which ended June 30 last, when no fewer than 7,530 members passed a first aid examination, an increase of 129 over the previous year. There has been a satisfactory influx of recruits to the movement, 747 men having taken their first year certificates, as compared with 657 during the previous twelve months. The Athlone bowl, awarded to the division securing the highest proportion of new members, was won by the Central Wales Division. The annual competitions again attracted a good entry, 292 teams participating, 112 in the advanced class and 180 in the beginners' class. The various challenge trophies available in both classes in each of the seventeen ambulance divisions, together with prizes in kind provided by the directors, were presented to the winners at functions held subsequently and presided over by the company's officers.

The final competition, in which eight selected teams took part, was held at Paddington on May 1, when the Directors' challenge shield, the premier trophy, was won by Swindon, and the Carvell cup (for runners-up) by Fishguard Harbour. The Deputy Chairman of the company, Mr. Charles J. Hambro, presided over the proceedings following the final competition and made the presentations, which included the award of the Butt bowl (made annually to the beginners' team securing highest position in the series of competitions) to the Swindon (B) team. At the inter-railway competition, held at the Wharnclyffe Rooms on May 28, the Swindon and Fishguard Harbour teams represented the railway, but were unsuccessful in winning the St. John Ambulance Association trophy. In the Welsh inter-railway competition, held at Cardiff on November 5, 1935, the Fishguard Harbour team obtained first place and was awarded the Harry Webb cup.

The Great Western Railway ambulance movement has been presented with three further trophies during the year. Mr. S. Morris, late Divisional Superintendent, Gloucester, was the donor of a silver cup to the Gloucester Corps, and Mr. J. R. Morris, Divisional Superintendent, Chester, presented a challenge shield for competition in his division. A challenge shield was also presented by Mr. D. Spurrell Davies, Assistant District Traffic Manager, Oswestry, to first aid competitors in the Central Wales Division.

A noteworthy feature of the year's work was the large number of cases of exceptionally meritorious first aid rendered by members of the company's staff, many of which were in respect of accidents outside the railway. Reports of such skilled assistance were adjudicated upon by the company's Chief Medical Officer, and gold, silver

and bronze medals and special certificates awarded. These were presented on the occasion of the final competition. During the year no fewer than 420 gold medals for 15 years' first aid efficiency; 114 bars (20 years' efficiency); 93 Quarter Century medals; and 24 bars (30 years' efficiency), have been issued, while 8 members of the staff qualified for the new 35-year bar inaugurated in 1935. The total number of the company's gold efficiency awards to date is:—

15-year medals	..	..	2,242
20 " bars	..	..	1,002
25 " medals	..	..	422
30 " bars	..	..	100
35 " bars	..	..	8

In accordance with the usual custom, Great Western Railway gold medallists foregathered with their wives for their annual outing; the venue selected this year was Leamington, where the party was welcomed by the Mayor of Leamington and entertained to lunch by the company.

As a result of recommendations made by the Central Ambulance Committee,

one member of the staff has been promoted by the Order of St. John to the rank of Officer, and four others admitted as Serving Brothers. The Vellum Vote of Thanks of the order has been awarded in two cases. These honours have been bestowed in recognition of exceptional services rendered to the G.W.R. ambulance movement over a long period of years. A census of trained ambulance men was taken throughout the system in October, 1935; for this purpose only employees who had passed a first aid examination during the previous five years were regarded as efficient. The census disclosed the fact that 9,362 employees, or 10 per cent. of the total staff, are qualified ambulance workers, and that no fewer than 6,567 of this number have passed four or more first aid examinations.

The movement has sustained a loss in the retirement of Mr. J. F. Lean, Principal Assistant to the General Manager, who from 1919 to 1936 was Chairman of the Central Ambulance Committee, and was a prominent and welcome figure at various social and other functions in connection with the movement.

Special Traffic at Nuremberg

The congress of the German National-Socialist party, held at Nuremberg from September 8 to 14, necessitated extensive special traffic arrangements, on a larger scale than in 1935, about 1 million passengers being conveyed in 1,279 special trains inclusive of 76 extra portions of ordinary trains. In 1935 the numbers were 850,000 passengers and 1,042 trains. This year there were also 1,364 special empties movements, and 84 special military trains against 36 in 1935. The crowded lines leading to the city made it difficult to work in the extra freight facilities required to cater for the visitors. Nuremberg is the most important goods transit and interchange point in south-east Germany and arrangements were therefore made to deviate certain goods trains, whereby the normal traffic was

reduced about 20 per cent. Thus goods from Leipzig to Crailsheim were routed via Würzburg and Lauda; to Ulm via Würzburg and Kornwestheim; and to Augsburg and Munich via Hof and Regensburg. These services normally run via Saalfeld and Nuremberg. Bebra routed its trains to Munich, Augsburg, and Ulm via Mannheim and Kornwestheim instead of through Würzburg. Traffic for the Nuremberg area itself was provisionally held at certain out stations, such as Wiesau, Kulmbach, and Crailsheim, and sent on as opportunity offered under the orders of a special control office. The Deputy General-Manager, Herr Kleinmann, has published in *Die Reichsbahn* a message of thanks to the railwaymen for the efficient way in which the arrangements were carried out.

Forthcoming Events

- Oct. 30 (Fri.).—Institute of Transport (Manchester-Liverpool), at Central Library, Manchester, 6.30 p.m. "Inland Waterways of Today," by Mr. E. Bayliss.
Institution of Heating and Ventilating Engineers (London Associate), at Borough Polytechnic, Borough Road, S.E.1, 7 p.m. "Tube Manufacture," by Mr. J. Gent.
Nov. 3 (Tues.).—Institute of Transport (Bristol), at the University, 6 p.m. "International Conventions and Governmental Regulations for Air Transport," by Mr. N. Edgar.
Institute of Transport (Metropolitan Graduate), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. "Application of Motor Transport to Tramway Track Maintenance," by Mr. C. Withey; "Private Hire Operation under the Road Traffic Acts," by Mr. L. Kitchin; "Some Little-known Difficulties of the Locomotive Running Department," by Mr. A. Sapsford; "Storage," by Mr. J. Taylor.

- Institution of Civil Engineers, Great George Street, London, S.W.1, 6 p.m. Presidential Address by Sir Alexander Gibb, G.B.E.
L.N.E.R. (Newcastle-Sunderland), at Sunderland, 7 p.m. "Works Railway Operations," by Mr. I. Baker.
Nov. 5 (Thurs.).—Institution of Electrical Engineers, Savoy Place, London, W.C.2, 6 p.m. "The Effects of Impulse Voltages on Transformer Windings," by Messrs. T. Allibone, D. McKenzie and F. Perry.
Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "Passenger Services Withdrawn Since Grouping," by Mr. G. Daniel.
Nov. 6 (Fri.).—Institute of Transport (East Midlands), at Guildhall, Nottingham, 6.30 p.m. Inaugural Meeting.
Institute of Transport (Leeds), at Town Hall, 6.30 p.m. "British Air Transport—Its Present Problems," by Group-Captain W. Promrose.
Railway Students' Association (Edinburgh), at Goolld Hall, 7.30 p.m. "Railway Research Work," by Mr. T. Herbert.

South Indian Railway Co. Ltd.

THE Directors are prepared to receive Tenders for the supply of:—

100 TONS COPPER INGOTS.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company Limited, marked "Tender for Copper

Ingots," with the name of the firm tendering, must be left with the undersigned not later than 10 a.m. on Friday, the 6th November, 1936.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 10s. for each copy of the Specification.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
29th October, 1936.

OFFICIAL NOTICES

WANTED for engineering company in India, a young engineer with apprenticeship in locomotive works and subsequent experience in running or locomotive practices, age about 25. Applicants please state details schooling, workshop experience technical qualifications. Situation permanent, prospects good for qualified applicant.—Box No. 23, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, S.W.1.

CONTRACTS AND TENDERS

The Hunslet Engine Co. Ltd. has received an order from the Crown Agents for the Colonies for one 0-4-0 saddle-tank locomotive for the 5 ft. 6 in.-gauge lines of the Ceylon Harbour Commission.

Nasmyth Wilson & Co. Ltd. has received an order from the Bengal & North Western Railway, to the inspection of Messrs. Rendel, Palmer & Tritton, for two superheated boilers for old B class locomotives.

Nasmyth, Wilson & Co. Ltd. has also received an order from the Crown Agents for the Colonies for five sets of parts required for the conversion of five Baldwin 4-6-0 tender locomotives to 4-6-2 tank locomotives for the Palestine Railways.

D. Wickham & Co. Ltd. has received a repeat order from the Midland Uruguay Railway for two No. 8 petrol-driven light inspection railcars.

The Gloucester Railway Carriage & Wagon Co. Ltd. has received an order from the National Benzol Co. Ltd. for 60 Class "A" 14-ton tank wagons for the conveyance of inflammable liquids.

Robt. Stephenson & Co. Ltd. has received an order from the Crown Agents for the Colonies for one superheated locomotive boiler for "301" class locomotive, for the Nigerian Government Railway.

The North British Locomotive Co. Ltd. has received an order from the Bengal & North Western Railway, to the inspection of Messrs. Rendel, Palmer & Tritton, for five superheated boilers required for class P 4-6-0 locomotives.

The Egyptian State Railways Administration has placed the following orders:—

Atlas Carbon & Battery Co. Ltd.: Battery materials (Ref. No. E.S.R. 34,663, total price £306 5s., f.o.b. London).

Belfast Ropeworks Co. Ltd.: Ropes (Ref. No. E.S.R. 43,355, total cost £269, f.o.b. Liverpool).

James Thornton & Son: Drying cloth (Ref. No. E.S.R. 43,356, total cost £222, f.o.b. London-Liverpool).

The Indian Stores Department has placed orders with Martin & Co. and Imperial Chemical Industries (India) Limited for fog signals.

Imperial Chemical Industries (India), Limited has received an order from the Bengal-Nagpur Railway Administration for 2,500 yd. of Rexine leather cloth manufactured by Imperial Chemical

Industries (Rexine) Limited and to be supplied at a total price of Rs. 7,382.

The General Electric Co. Ltd. has received an order from the Southern Railway for a three years' supply of Osram electric lamps.

Charles Roberts & Co. Ltd. has received an order from the National Benzol Co. Ltd. for 36 Class "A" 14-ton tank wagons for the conveyance of inflammable liquids.

Bayliss, Jones & Bayliss Limited has received an order from the Central Argentine Railway for 100,000 steel fishbolts, nuts and washers for 85-lb. rails.

Miller & Co. Ltd. has received an order from the Entre Rios Railways for 200 chilled cast-iron wagon wheels.

The North British Locomotive Co. Ltd. has also received an order from the Siamese State Railways for six spare boilers required for 4-6-0 locomotives and to be supplied to the inspection of Messrs. Sandberg.

Whitelegg & Rodgers Limited has received an order from the South African Railways & Harbours Board for 50 sets of Ajax grease lubricating equipment for the conversion of existing locomotives and an order from the Vulcan Foundry Limited for 24 sets of similar equipment required for the Buenos Ayres Great Southern Railway.

Stewarts and Lloyds Limited has received an order from the Buenos Ayres Great Southern Railway for 4,400 solid drawn black steel boiler tubes.

The Madras & Southern Mahratta Railway Administration has placed the following orders to the inspection of Messrs. Rendel, Palmer & Tritton: Tubes Limited, 170 Steel flue tubes; North British Locomotive Co. Ltd., 24 Axleboxes and horn cheeks; J. Baker & Bessemer Limited, 100 Locomotive tyres.

The South Indian Railway Administration has placed the following orders for equipment to the inspection of Messrs. Robert White & Partners:—

J. Stone & Co. Ltd., 304 alkaline cells for train lighting and four train lighting dynamos and switches.

Mather & Platt Limited, Four train lighting dynamos and switches.

Surahammars Bruks, 90 pairs of metre-gauge wheels and axles.

T. F. Johnson, carriage fittings.

Thomas Firth & John Brown Limited, 260 locomotive tyres.

The Incandescent Heat Co. Ltd. has in recent months considerably extended its Smethwick (Birmingham) works in order to cope with the large number of orders for heat-treatment furnaces received from British and foreign firms. Equipment has recently been supplied to Government departments, motorcar manufacturers, and large iron and steel works. Further extensions to the works are now being carried out.

Leyland Motors Limited has received the following orders from railway-associated road transport operators:—

Southdown Motor Services Limited, 4 oil-engined Titans and 6 cubs; Western Welsh Omnibus Co. Ltd., 39 oil-engined Tigers; Lincolnshire Road Car Co. Ltd., 25 oil-engined Tigers; Yorkshire Traction Co. Ltd., 30 oil-engined Tigers; Yorkshire Woollen District Transport Co. Ltd., 17 oil-engined Tigers; County Motors (Lepton) Limited, 4 oil-engined Tigers; Wilts & Dorset Motor Services Limited, 2 oil-engined Lions; Central S.M.T. Co. Ltd., 15 Oil-engined Titans and 110 oil-engined Tigers; Maidstone & District Motor Services Limited, Four oil-engined Titans and seven oil-engined Tigers; Melbourne Tramways, One Tiger.

Tenders are invited, receivable by the Agent, Burma Railways, India, by November 19, for the supply of mild steel sections, electrodes and vacuum brake fittings during 1937-8.

The Indian Stores Department is calling for tenders (Contract No. N-7369) for the supply and delivery, f.o.r. Sealdah railway station, of a wheel lathe, a vertical spindle surface grinding machine, a single spindle motion link radius and hole grinding machine, an axle journal re-turning, cold rolling and wheel boss facing lathe, and a 30 in. roller-feed sand papering machine and spares for each item. Tenders are receivable in India by November 19.

Tenders are invited by the Egyptian State Railways Administration, receivable at the Stores Department, Saptieh, Cairo, by December 8, for the supply of two steel yard truck weighbridges.

The Argentine State Railways Administration is calling for tenders, to be presented in Buenos Aires by November 21, for the supply of pulley blocks, pulley sets, bottle jacks, and locomotive jacks. The Argentine State Railways Administration is also calling for tenders, to be presented in Buenos Aires by November 20, for the supply of 120 sets of steel switches for rails, and for tenders receivable by November 24 for the supply of 14 portable sets for electric arc welding. Firms desirous of offering equipment of United Kingdom manufacture can obtain further details from the Department of Overseas Trade.

Railway Share Market

Home railway stocks have been affected by the rather easier conditions in evidence in most sections of the Stock Exchange. It is probably true that had markets been more buoyant the junior stocks would have responded favourably to the past week's traffics as the latter were up to best expectations. They show an aggregate increase of £97,000 for the week, despite a decline in coal receipts owing to the fact that comparison is still with a period last year when there were unusually large movements of coal owing to fears of labour troubles in the South Wales coal trade.

L.M.S.R. ordinary has been relatively steady around 30½ on the belief that if traffics continue their present trend for the rest of the year a dividend of 1½ per cent. on this stock will be likely. For the past week the railway's traffics increased by £48,000. Both the 4 per cent. pre-

ference and 1923 preference were bought on any reaction and appear to be rather moderately valued in view of the yields offered. Southern deferred was active around 26, the £22,000 increase in the past week's receipts being regarded as very good and as indicating that improvement in tourist traffic is already making itself felt. It is considered doubtful, however, whether more than ½ per cent. is being earned on the deferred stock and there are still very divergent opinions in the market as to whether dividends will be resumed for the current year. In any case, best estimates do not exceed ½ per cent. L.N.E.R. second preference kept around 30 and the first preference was 78. The small traffic gain of £9,000 was regarded as very disappointing, but it is expected that better figures will be forthcoming shortly. Great Western ordinary maintained a fairly steady appearance,

buyers being in evidence on any fractional decline in price. In this case the traffic gain of £18,000 created a satisfactory impression and was up to expectations. Debenture stocks of the main line railways retained their customary firmness. Elsewhere, London Transport "C" was reactionary in advance of publication of the report.

Argentine railway stocks again attracted chief attention in the foreign railway market. B.A. Gt. Southern did not benefit from the statements at the meeting, although Sir Follett Holt was able to point out that the outlook for the company is certainly more promising than it was a year ago. Central Argentine ordinary found buyers around 19, but B.A. Pacific was reactionary and the debentures showed fractional losses, while Argentine Great Western 5 per cent. debentures declined a point to 66. San Paulo and Nitrate Railways reacted moderately. American railroad shares were steady and Canadian Pacific better around 13½.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

Railways	Miles open 1935-36	Week Ending	Traffics for Week		No. of Weeks	Aggregate Traffics to Date			Shares or Stock	Prices			
			Total this year	Inc. or Dec. compared with 1935		Totals		Increase or Decrease		Highest 1935	Lowest 1935	Oct. 28, 1936	Yield % (See Note)
						This Year	Last Year						
			£	£		£	£	£					
Antofagasta (Chili) & Bolivia	834	25.10.36	16,270	+ 710	43	587,430	530,640	+ 56,790	Ord. Stk.	23	1415½	21	Nil
Argentine North Eastern	753	24.10.36	9,700	+ 3,977	17	158,650	139,690	+ 18,960	"	7	4	7½	Nil
Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	49½	30	50	8
Bolivar	174	Sept., 1936	5,200	+ 200	39	57,700	55,300	+ 2,400	6 p.c. Deb.	13	5	7½	Nil
Brazil	—	—	—	—	—	—	—	—	"	14	11	16½	3
Buenos Ayres & Pacific	2,806	24.10.36	79,471	+ 1,375	17	1,258,340	1,245,283	+ 13,057	Ord. Stk.	10½	47½	11	Nil
Buenos Ayres Central	190	10.10.36	\$177,600	+ \$71,300	15	\$2,048,500	\$1,917,400	+ \$131,100	Mt. Deb.	21	10	30	Nil
Buenos Ayres Gt. Southern	5,084	24.10.36	119,824	+ 7,849	17	1,849,196	2,031,805	+ 182,609	Ord. Stk.	27	13½	22	Nil
Buenos Ayres Western	1,930	24.10.36	44,471	+ 6,868	17	666,937	664,252	+ 2,685	"	24	10	18	Nil
Central Argentine	3,700	24.10.36	139,925	+ 22,195	17	2,321,897	2,008,384	+ 313,513	"	177½	7	19	Nil
Do.	—	—	—	—	—	—	—	—	Div.	9	3¼	10	Nil
Cent. Uruguay of M. Video	273	17.10.36	12,091	+ 3,745	16	173,466	136,307	+ 37,159	Ord. Stk.	8½	3	5	Nil
Do. Eastern Extn.	311	17.10.36	1,755	+ 514	16	26,777	21,530	+ 5,247	—	—	—	—	—
Do. Northern Extn.	185	17.10.36	1,175	+ 271	16	21,735	17,298	+ 4,437	—	—	—	—	—
Do. Western Extn.	211	17.10.36	1,217	+ 377	16	15,462	11,949	+ 3,513	—	—	—	—	—
Cordoba Central	1,218	24.10.36	25,650	+ 1,850	17	562,320	532,220	+ 30,100	Ord. Inc.	4	1	2	Nil
Costa Rica	188	31.8.36	17,130	+ 458	8	38,568	30,402	+ 8,166	Stk.	35	30	36	5½
Dorada	70	Sept., 1936	14,400	+ 2,200	39	126,600	105,500	+ 21,100	1 Mt. Db.	1035½	102½	104½	5¼
Entre Rios	810	24.10.36	13,541	+ 3,732	17	211,637	201,109	+ 10,528	Ord. Stk.	15	6½	11	Nil
Great Western of Brazil	1,082	24.10.36	10,300	+ 800	43	318,700	320,700	+ 2,000	Ord. Sh.	1½	2½	3½	Nil
International of Cl. Amer.	701	Aug., 1936	\$317,321	+ \$12,980	35	\$3,624,632	\$3,265,010	+ \$359,622	—	—	—	—	—
Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	12	32	12	Nil
La Guaira & Caracas	22½	Sept., 1936	4,350	+ 790	39	41,545	34,985	+ 6,560	Sik.	8½	8	5½	Nil
Leopoldina	1,918	24.10.36	23,868	+ 3,071	43	828,242	761,217	+ 67,025	Ord. Stk.	8½	2½	7½	Nil
Mexican	483	24.10.36	\$261,900	+ \$11,210	16	\$4,127,800	\$4,007,600	+ \$120,200	—	112	14	24	Nil
Midland of Uruguay	319	Sept., 1936	7,673	+ 2,348	13	23,343	16,336	+ 7,007	—	112	12	29	Nil
Nitrate	397	15.10.36	4,185	+ 3,518	41	97,785	117,837	+ 20,052	Ord. Sh.	64½	42½	78½	75½
Paraguay Central	271	17.10.36	22,315,000	+ \$396,000	16	\$41,684,000	\$35,044,000	+ \$6,640,000	Pr. Li. Stk.	80½	60	78½	75½
Peruvian Corporation	1,053	Sept., 1936	85,485	+ 16,210	13	257,040	217,772	+ 39,274	Pref.	105	67½	12	Nil
Salvador	100	17.10.36	\$14,000	+ \$3,021	16	\$170,730	\$189,521	+ \$18,791	Pr. Li. Db.	65	61	15	Nil
San Paulo	153½	18.10.36	23,430	+ 3,642	42	1,242,836	1,029,828	+ 213,008	Ord. Stk.	80	35	85½	25½
Taltal	164	Sept., 1936	2,605	+ 1,700	13	8,755	9,250	+ 495	Ord. Sh.	111½	118	111½	75½
United of Havana	1,353	24.10.36	14,731	+ 539	17	260,200	277,830	+ 17,630	Ord. Stk.	31½	1	2½	Nil
Uruguay Northern	73	Sept., 1936	897	+ 299	13	2,590	1,797	+ 793	Deb. Stk.	4½	21½	41	Nil
Canada.													
Canadian National	23,613	24.10.36	863,802	+ 73,663	42	29,371,348	27,430,330	+ 1,941,018	—	—	—	—	—
Canadian Northern	—	—	—	—	—	—	—	—	Perp. Dbs.	785½	52½	73½	57½
Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	1035½	93	102½	37½
Canadian Pacific	17,223	21.10.36	641,390	+ 8,800	42	21,908,000	20,382,800	+ 1,525,200	Ord. Stk.	141½	83	13	Nil
India.													
Assam Bengal	1,329	31.9.36	40,650	+ 1,526	26	612,211	589,899	+ 22,312	Ord. Stk.	92½	77½	86½	37½
Barsi Light	202	31.9.36	2,123	+ 1,012	26	60,150	72,022	+ 11,872	Ord. Sh.	105	77½	69½	71½
Bengal & North Western	2,112	31.9.36	62,048	+ 6,357	26	1,321,176	1,219,530	+ 101,646	Ord. Stk.	301½	291	313	5½
Bengal Doonars & Extension	161	10.10.36	4,260	+ 97	28	68,668	70,092	+ 1,424	—	127½	122	122½	51½
Bengal-Nagpur	3,268	10.10.36	157,123	+ 18,245	28	3,197,836	3,330,296	+ 132,460	"	105	100½	102½	37½
Bombay, Baroda & Cl. India	3,072	21.10.36	235,050	+ 27,300	29	4,463,175	4,277,475	+ 185,700	"	115½	110	112½	55½
Madras & Southern Mahratta	3,229	3.9.36	129,675	+ 6,539	26	2,743,052	2,694,532	+ 48,520	"	128½	113½	112½	8
Rohilkund & Kumaon	544	30.9.36	11,138	+ 839	26	253,081	230,624	+ 22,457	"	294	262	311½	5½
South Indian	2,532	10.10.36	112,404	+ 3,057	28	2,142,290	2,148,716	+ 6,426	"	119½	104½	103½	59½
Various.													
Beira-Umtali	204	Aug., 1936	73,900	+ 3,933	48	719,218	710,272	+ 8,946	—	—	—	—	—
Bilbao River & Cantabrian	15	Sept., 1936	1,639	+ 478	40	13,631	13,358	+ 273	—	—	—	—	—
Egyptian Delta	621	10.10.36	9,995	+ 176	28	119,568	111,419	+ 8,149	Prf. Sh.	2	16½	14	51½
Great Southern of Spain	104	21.8.36	568	+ 2,514	35	33,629	62,623	+ 28,994	Inc. Deb.	3½	2	3½	Nil
Kenya & Uganda	1,625	Sept., 1936	165,531	+ 2,618	38	1,947,395	1,809,464	+ 137,931	—	—	—	—	—
Manila	—	—	—	—	—	—	—	—	B. Deb.	48	36	45½	71½
Mashonaland	913	Aug., 1936	112,733	+ 4,855	48	1,131,918	1,277,362	+ 145,444	1 Mg. Db.	104½	100	102½	47½
Midland of W. Australia	277	Aug., 1936	11,651	+ 393	9	21,865	23,052	+ 1,187	Inc. Deb.	98½	93	95	4½
Nigerian	1,905	8.9.36	37,501	+ 20,554	23	652,743	527,724	+ 125,019	—	—	—	—	—
Rhodesia	1,538	Aug., 1936	207,304	+ 4,235	48	2,075,634	2,126,923	+ 51,289	4 p.c. Db.	105½	101	106	3½
South African	13,263	3.10.36	666,669	+ 72,665	26	16,051,262	14,721,911	+ 1,329,351	—	—	—	—	—
Victoria	4,728	June, 1936	703,693	+ 16,855	52	9,689,925	9,421,092	+ 268,833	—	—	—	—	—
Zafra & Huelva	112	May, 1936	8,821	+ 2,027	22	48,574	55,398	+ 6,823	—	—	—	—	—

Note.—Yields are based on the approximate current prices and are within a fraction of 1½.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

The Silver Jubilee and the Diesel

AN exceedingly interesting account of the events leading up to the inauguration of the Silver Jubilee streamlined steam train service on the L.N.E.R. was given by Sir Nigel Gresley in his presidential address to the Institution of Mechanical Engineers on October 23. Sir Nigel said that in 1934, when he visited Germany, he was so much impressed by the smooth running of the Flying Hamburger at 100 m.p.h. over long distances that he thought it advisable to examine the possibilities of such a train on the L.N.E.R. Accordingly he approached the makers of that train and gave them full particulars of the line and speed restrictions between London and Newcastle. With characteristic German thoroughness they made an exhaustive investigation, and, after adding 10 per cent. which they regarded as adequate to meet varying weather conditions and out-of-course delays, their estimated time was 4 hr. 17 min. up and 4 hr. 15½ min. down. Sir Ralph Wedgwood then suggested that with the ordinary Pacific engine faster overall speeds could be maintained with a train of greater weight, capacity, and comfort, and a trial run with seven carriages showed that the journey could be accomplished with reliability in less than four hours. Thus came the Silver Jubilee. Sir Nigel Gresley, of course, was not making any direct comparison between the Silver Jubilee and the Flying Hamburger or any high-speed diesel train. The L.N.E.R. desired a diesel train with two 410 b.h.p. engines, but stipulated a three-car train holding 140 passengers, the estimated weight of which came out at 115 tons, compared with 80 tons of the two-car Flying Hamburger. Thus the Flying Hamburger type was given up for the slower Dutch type with 7 b.h.p. per ton of tare instead of 10. The Silver Jubilee is a much larger and more powerful train, and if the stipulations for both types had been not on a power basis but strictly on the time possible for a given carrying capacity advocates of diesel traction contend that the diesel train would have proved the faster and more economical proposition. It would have provided the 60 seats less than the Silver Jubilee, but at an initial cost of just over £20,000 compared with the £34,500 of the steam train.

The Denver Zephyrs

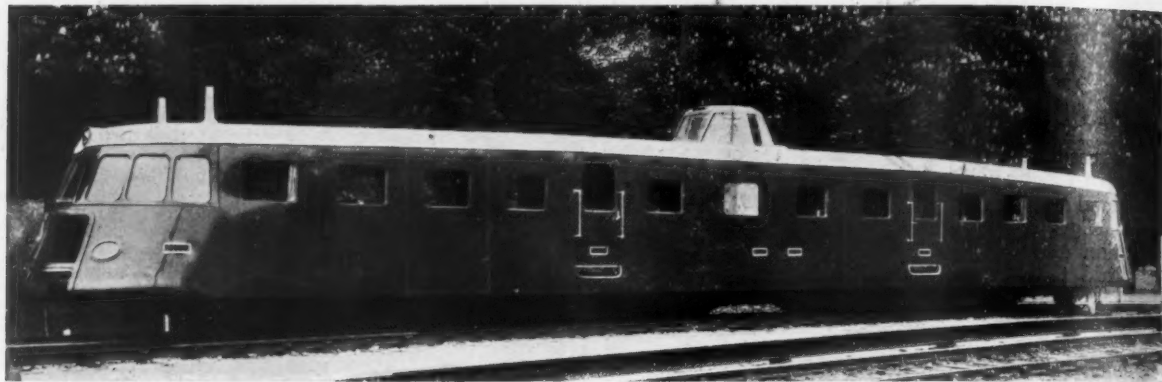
ONCE again the thousand-mile run between Chicago and Denver has been covered non-stop by a diesel train of the Zephyr type, and once again a record has been broken. This time the journey was accomplished in the east to west direction by one of the new 12-car 3,000 b.h.p. stainless steel trains, and the start-to-stop average speed for the 1,034 miles was 84.4 m.p.h. In 1934 the original three-car 660 b.h.p. Burlington Zephyr made the run in the west to east direction at an average of 77.6 m.p.h., but by a slight variation in route and a termination at Halsted Street station, Chicago, the mileage was 1,015.4. A complete log of this run was given in the March 22, 1935, issue of this Supplement. On that occasion a maximum speed of 112.5 m.p.h. was

attained, but on the run of October 23-24 last it is claimed that two miles were covered at 116 m.p.h.; and the total time was 12 hr. 12 min. 27 sec. compared with 13 hr. 4 min. 58 sec. for the shorter run in 1934. On October 16 an unusual trip was staged between Philadelphia and Trenton on the Pennsylvania system with the ten passenger cars. As the two power cars were being put through their final trials at the Budd works, the stainless steel coaches were hauled by a Pennsylvania streamlined electric locomotive No. 4850. The Zephyr cars being 2 in. wider than the standard, and the platform being slightly curved, great care was taken to prevent grazing the platform edge, and it took 7¼ min. for the whole train to clear the platform. The actual schedule on the Chicago—Denver route to be maintained from the beginning of November by the new trains is 16 hr. westbound for a journey of 1,034 miles, and 15 hr. 50 min. eastbound when, by following a slightly different route, the journey will be 1,039 miles. The respective end-to-end speeds including eleven intermediate stops, will be 64.9 and 65.8 m.p.h. For the past few months this schedule has been worked to by the so-called Advance Zephyrs, which actually are the original Burlington Zephyr and the *Mark Twain*, both operating as four-car sets.

Main-Line Single Unit Cars

TWO of the railcars described in this issue may be contrasted to show the scope and variety of the single-unit vehicle in main-line work. The 600 b.h.p. P.L.M. vehicle has two engines and two sets of electric transmitters; the 290 b.h.p. Fiat car has two engines and two sets of mechanical transmission. The French car is used, as occasion requires, for trailer haulage, whereas the car of the Italian State Railways is intended only for solo operation, and has a buffet and semi-*de luxe* seats compared with the more utilitarian ordinary seating accommodation of the P.L.M. car. Relatively moderate maximum speeds are expected from the French car, which works through trains over the exceedingly arduous route from Marseilles to Grenoble, running from Marseilles to Veynes as an express unit and thence to Grenoble as a stopping train. On the other hand the Italian cars are used for fast trains with infrequent stops over the level lines in the plains of Lombardy, and have a normal maximum speed of 81 m.p.h. against 68 m.p.h. of the French unit; and they can maintain this speed up a 1 in 330 grade, while on the P.L.M. the 600 b.h.p. Decauville cars are expected to maintain the more decorous rate of 30 m.p.h. up long grades of 1 in 40. In both cases the body and underframe are integral structures of welded high-tensile steel sections with steel outer and aluminium inner panels; but in the French car the side framing is arranged as two deep beams which take most of the load, whereas in the Fiat car there is no main member and every part of the tubular frame is almost equally proportioned and takes its share in carrying the various loads. Finally both types have an aggregate engine power in excess of 10 b.h.p. per ton of tare weight, giving rapid acceleration from normal stops or out of course slacks.

A NEW FRENCH DOUBLE-BOGIE RAILCAR

Further development of the Renault design

300 b.h.p. diesel-mechanical railcar for either-direction working

SEVERAL departures from Renault standard practice characterise a new design of railcar being built at Billancourt, on the outskirts of Paris, and the first of which is now running under close observation on the lines of the French State Railways. Classified in the Renault list as Type AEK, the new vehicles have conning-tower drive and two engines aggregating 300 b.h.p., the torque of which is transmitted to the wheels through a four-speed gearbox. The seating capacity is 64 on a tare weight of 22.1 tonnes (21.8 tons) and the top speed is 120 km.p.h. (75 m.p.h.). In the first car the seats are of the reversible type and have arm rests, but arrangements have been made to fit 88 fixed third-class seats and 4.6 sq. m. (50 sq. ft.) of baggage space in some of the remaining five cars now under construction. Lavatory accommodation is provided in both designs.

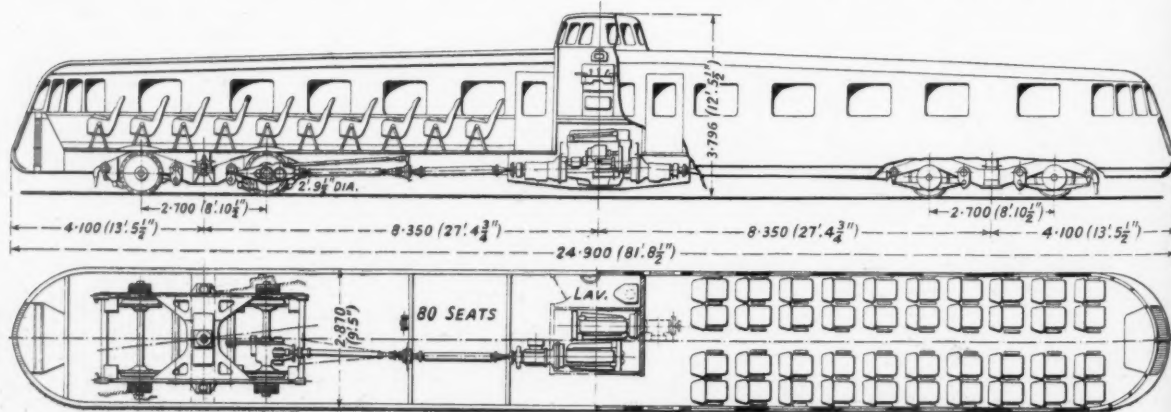
Performance

In the 64-seater car the characteristics ratios are 13.6 b.h.p. per ton of tare, 10 b.h.p. per ton of gross weight, 4.7 b.h.p. per seat, and 760 lb. per seat. For the third-class car the ratios are 13.6 b.h.p. per ton of tare, 9.4 b.h.p. per ton of gross weight, 3.4 b.h.p. per seat, and 560 lb. per seat. These ratios allow of exceedingly high rates of acceleration under all conditions, for the car is not designed for use with trailers, and the engine power

is devoted solely to the 30 tons of gross car weight. As may be seen from the accompanying diagram an acceleration rate of 1.0 m.p.h.p.s. (1.6 km.p.h.p.s.) can be maintained up to 28.29 m.p.h. (47.48 km.p.h.) on the straight level, and an average rate of 0.475 m.p.h.p.s. (0.764 km.p.h.p.s.) up to 60 m.p.h. (97 km.p.h.) under similar conditions. Up a 1 in 40 (2.5 per cent.) grade the car can maintain a sustained 29.5 m.p.h. (47.5 km.p.h.) and it can reach this speed from rest on the grade in 53 sec., an average acceleration rate of 0.55 m.p.h.p.s. (0.88 km.p.h.p.s.).

On a distance basis the highest acceleration rate on the straight level is from rest to 60 m.p.h. (97 km.p.h.) in 2,510 yd. (2,300 m.), and to 70 m.p.h. (112 km.p.h.) in 4,800 yd. (4,400 m.). Up a 1 in 40 (2.5 per cent.) grade the top speed of 29.5 m.p.h. (47.5 km.p.h.) can be attained in 465 yd. (425 m.).

The possibilities resulting from the use of a high b.h.p. per ton of weight in combination with a smooth streamlined body and roller bearing axleboxes are shown in striking fashion in the graph depicting the maximum performance on various grades. With two engines in operation a speed in excess of 112 km.p.h. (70 m.p.h.) is possible up a 0.5 per cent. (1 in 200) grade, and at the other end of the scale the power is sufficient to permit of a speed of 32 km.p.h. (19.8 m.p.h.) up a 6.7 per cent.



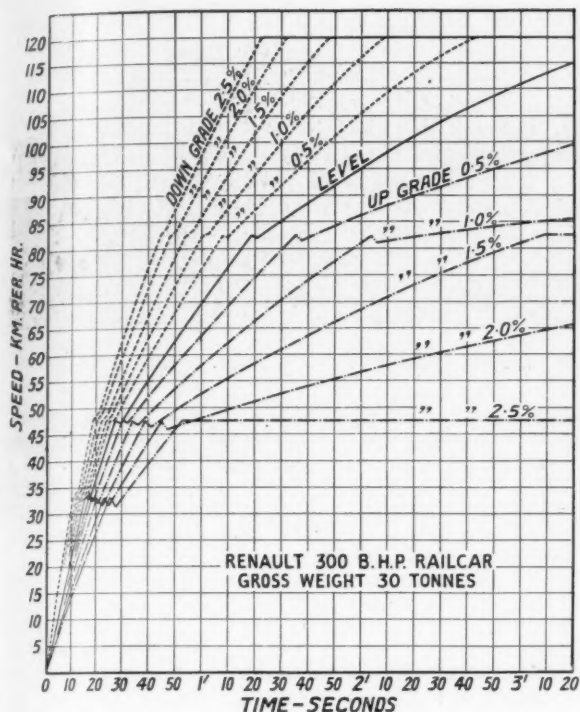
General arrangement of the latest Renault double-engine car

120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

SPEED - KM. PER HR.

(1 in
that i
speed
0.5 pe
All th
engine
the go
this e
48, 82

Foll
of the
form o
the lo
of a s
very r
beams
level a
are bu
standa
collisio
some
takes
with p
body f
denum
the ch
the ac
load of
centres
was no
under
The w
is only
ing the



Acceleration diagram on a time basis for 300 b.h.p. diesel-mechanical railcar

(1 in 15) straight grade. With one engine in operation, that is, with 5 b.h.p. per ton of gross weight, the top speed on the level is 95 km.p.h. (59 m.p.h.) and on a 0.5 per cent. (1 in 200) grade, 81 km.p.h. (50 m.p.h.). All these figures are with the normal governed maximum engine speed of 1,500 r.p.m.; for test purposes, of course, the governor can be set to give a higher speed. With this engine speed the gear steps give track speeds of 33, 48, 82, and 120 km.p.h. (20.5, 30, 51, and 75 m.p.h.).

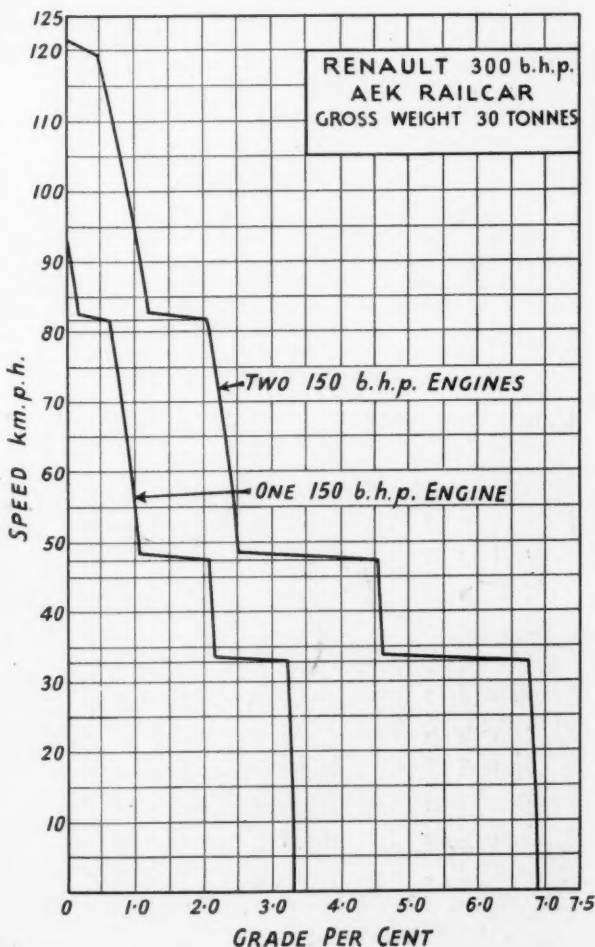
Mechanical Portion

Following general Renault practice the main members of the chassis are the body side frames, which are in the form of deep side beams extending from floor to cantrail; the longitudinal at floor level is of plate and the cantrail of a steel pressing; these two members are connected by very rigid vertical and diagonal braces, and the two side beams are tied together by transverse members at the floor level and by a light but rigid roof frame. The car ends are built up of light sections, and experience with the standard Renault 265 b.h.p. car has shown that in a collision the relatively light extremity of the car absorbs some of the impact and deforms, and the main frame takes up the remainder without deformation and with practically no damage to the passenger saloon. The body framing members are of high-tensile chrome-molybdenum steel and they are entirely welded up. One of the chassis of these AEK railcars, as shown in one of the accompanying illustrations, was tested with a dead load of 25 tonnes distributed uniformly between the pivot centres, which are 16.7 m. (54 ft. 11 in.) apart; there was no permanent deflection, but the deflection while under load was a maximum of 25 mm. at the centre. The weight of the whole frame, 25.16 m. (83 ft.) long, is only 3 tons. Owing to the different method of mounting the engines and transmission sets, the construction

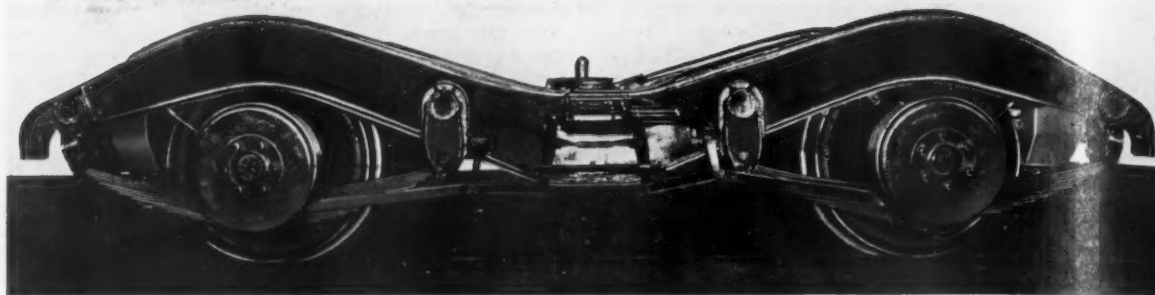
of this frame differs somewhat from that of the standard single-engine 265 b.h.p. vehicle.

In the second class car there are two saloons, with the engine compartment, baggage room, and lavatory between, the floor plan being similar to that of the well-known Bugatti railcars. The driving compartment is in a tapered conning tower above the engines with controls for either-way working. The reversible seats are covered in leather and have arm and head rests, and in effect are individual chairs although two seats are arranged on one tubular frame; the weight complete is only 10 kg. (22 lb.) per passenger. The side panel plates are of aluminium and take little part in the distribution of the stresses in the frames. The windows are not made to open and ventilation is assured by natural draught, the air being led in from a conduit in the roof. During a stop, and in hot weather, the natural ventilation is supplemented by electrically-driven fans which force air into the saloons through the natural draught ducts, or in winter through the heaters. The car is heated by passing the engine exhaust gases through heaters located in ducts at the bottom of the side panels. Five lamps with opaque globes are mounted down the centre of the roof of each passenger saloon and are fed from a nickel-cadmium battery of 218 amp. hr. capacity.

Each bogie is carried on four 850 mm. (33.5 in.) chrome-



Maximum performance of new Renault gear-drive car on various grades



Bogie of new Renault car; the left-hand axle takes the drive from a 150 b.h.p. engine

molybdenum cast steel wheels with a width over tread and flange of 140 mm. (5.5 in.), and mounted on chrome-molybdenum steel axles, the inner unit of each bogie taking the drive from one engine. The wheels weigh 90 kg. (200 lb.) each. The bogie frame structure is electrically welded throughout and is composed mainly of nickel-copper steel plates 3 and 4 mm. thick formed as shown in the accompanying drawing. The axles are carried in Timken taper roller-bearing boxes supported by underhung laminated springs composed of twelve plates 80 mm. (3.15 in.) wide by 11 mm. (0.435 in.) thick and with a length between end pins of 1.5 m. (59 in.). The normal service brake is of the Jourdain-Monneret air type acting on drums of 465 mm. (18.3 in.) diameter and 120 mm. (4.75 in.) wide fixed to the wheels. There is a further brake of the Lockheed hydraulically-controlled type, and also a hand brake.

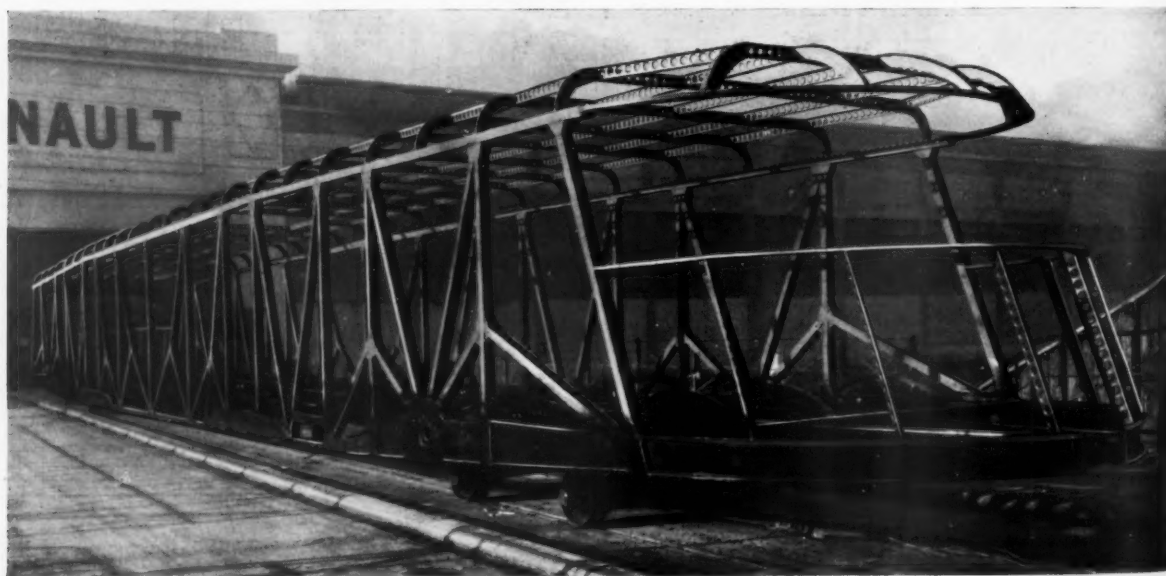
Engines and Auxiliaries

The engines are of a new type and have six cylinders in line, the bore and stroke being 140 mm. by 170 mm. (5.5 in. by 6.7 in.). Actually, the engine forms, with the necessary changes, one half of the standard 12-cylinder vee engine of 300 b.h.p., but this model itself has just been developed from the standard 265 b.h.p. 12-cylinder engine by the substitution of four valves per cylinder in place of two, separate instead of articulated connecting

rods, and sundry small changes. The normal full-load operating speed is 1,500 r.p.m. and at this rate the piston speed is 1,670 ft. per min. and the brake m.e.p. 82 lb. per sq. in. The compression ratio is approximately 16 to 1, and fuel is injected on the direct system at a pressure of about 2,850 lb. per sq. in. by a Précision pump through a central nozzle.

The crankcase and cylinder block are in an integral casting of aluminium alloy, which has cast iron liners inserted. Cast aluminium alloy is used for the separate cylinder heads, and the pistons also are of aluminium alloy and are fitted with four pressure and two scraper rings. Each cylinder head contains two inlet and two exhaust valves of chrome and cobalt steel respectively, the change compared with the cylinders of the 265 b.h.p. model giving a better water circulation round the head and lower valve temperatures, and gives a greater volumetric efficiency; it has permitted an increase of 12 per cent. in the continuous output in conjunction with reduced maintenance cost.

The two engines are set on rubber blocks supported on a subframe below the centre of the car as indicated on the diagram of the vehicle. They are located side by side but drive in opposite directions. The cylinder heads project through the car floor in a small engine room, and the cylinder heads, valves, and piston crowns may be inspected easily. Each engine has a Renault electric



Body framing of Renault 300 b.h.p. car; it is 83 ft. long and is entirely welded

start
plies
the
comp
to ca
and
the s

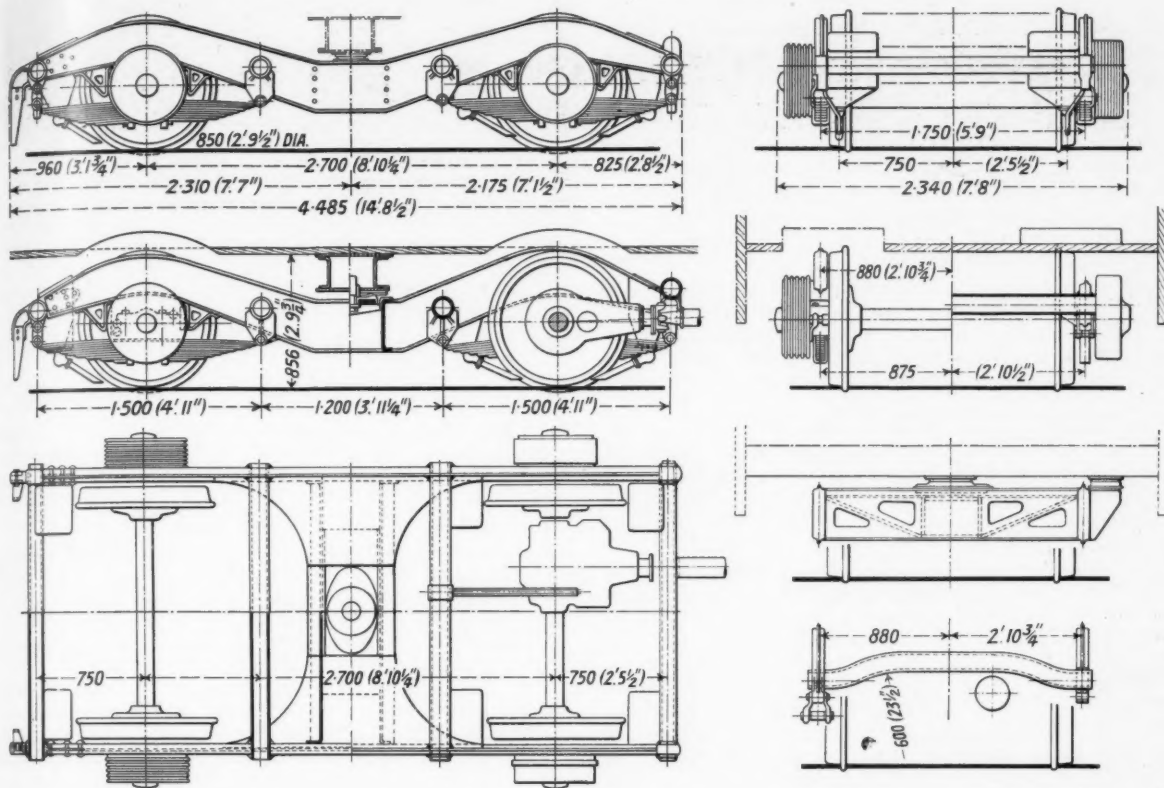


of 320
holding
cooling
and the

The
simpler
standar
engine
spondin
discs, a
Spicer
axle. T
thus is
when th
In th
by helic
levers r
elastic
Electro
provided
the imm
sure is c
engaged

starting motor fed by a 218 amp-hr. battery (which supplies the lighting current also) and which is charged by the two 600 watt dynamos, one to each engine. An air compressor for the control system and the brakes is fitted to each engine, and other fittings are Técalemit air filters, and a pressure lubrication system with an oil cooler in the sump. The two fuel tanks have an aggregate capacity

Electro-pneumatic control is employed also for gear changing. The four-speed gearbox has two shafts, primary and secondary. In top gear, where the drive is direct, the torque is taken from the driving shaft straight along the secondary shaft (which is concentric with it) and out to the axle, but for other steps the torque is taken from the driving shaft to the primary shaft and up to the



Arrangement of welded steel bogie of Renault 300 b.h.p. diesel-mechanical railcar

of 320 litres (70 gal.), and there is an emergency tank holding 25 litres (5½ gal.). Each engine has its own cooling system with the radiators at the ends of the car, and the single water tank is partitioned off.

Transmission

The layout of the mechanical transmission is much simpler and more direct than that used in the Renault standard 265 b.h.p. single-engine railcar. From each engine the drive is taken to the inner axle of the corresponding bogie through a friction clutch with Ferodo-lined discs, a four-speed gearbox, and a cardan shaft with Spicer flexible couplings to the reversing bevels on the axle. The axles are not coupled and the adhesion weight thus is limited to the load on two axles, or about 15 tons when the car is fully loaded.

In the Renault clutch are two sets of discs kept together by helical springs, and brought clear on declutching by levers radiating from the shaft. The discs themselves are elastic steel plates with a Ferodo crown on each side. Electro-pneumatic control of the clutching operations is provided, and the air pressure is arranged to bring about the immediate contact of the discs, but thereafter the pressure is diminished slowly as the clutch becomes more fully engaged.

secondary shaft. There are four wheels on the primary shaft, one on the driving shaft and three on the secondary shaft, but only those on the secondary shaft and the wheel on the driving shaft are fitted with clutches. There are two cone clutches and each has a double face in order to serve a gearwheel on each side. These clutches are moved from side to side as required, to presynchronise the speeds and then engage the gears, by means of dogs mounted on a short shaft and operated by a servo-motor on top of the gearbox casing. The secondary shaft pinions for the first, second and third speeds are carried on taper roller bearings. The gearbox casing is of aluminium alloy.

The gear ratios given in each of the two boxes of the AEK railcar are as follows:—

23	18	= 3.65 : 1	33 km.p.h.
36	42		
23	21	= 2.5 : 1	48 km.p.h.
36	37		
23	31	= 1.46 : 1	82 km.p.h.
36	29		
Direct		= 1.0 : 1	120 km.p.h.

The torque is led from the gearbox through the cardan shaft to a double drive terminating on the axle. The direction of motion is determined by sliding bevels, the 28-tooth crown wheel on the cardan shaft prolongation meshing with two 33-tooth bevels. These bevels are carried

on a bush surrounding a short shaft housed in taper roller bearings, and which in its centre portion, *i.e.*, between the bevels, is splined to carry a pinion of 20 teeth. This pinion is moved by a small compressed air servo-motor to mesh with the inside of the required bevel, and transmits its drive to a 34-tooth plain spur wheel mounted on the axle, the reduction of the whole set being 2·2:1.

Engine Tests

In accordance with the requirements of the French Railcar Commission the engine was given a 72-hr. test comprising 60 hr. continuously at normal full load and full speed (150 b.h.p. at 1,500 r.p.m.) and then after a break of 11½ hr. to a further 12 hr. under the same conditions. Immediately following the conclusion of the 12-hr. period, overload and overspeed tests were undertaken as indicated in an accompanying table. After a further gap of approximately 10 hr., fractional load and idling tests were undertaken for nearly 12 hr. continuously. These tests indicated that the fuel consumption at full load and speed was 175 gr. (0·39 lb.) per b.h.p. hr. and the lubricating oil consumption 2·45 gr. (0·0054 lb.) per b.h.p. hr. The average fuel consumptions under various conditions of load and speed are as shown in the two tables on this page. The engine idled regularly at 500 r.p.m.

Examination of the engines after the full series of tests had been concluded showed that the bronze bearings and white-metalling of the rods were in a good state. The bronze bearings of the crankshaft also were in good condition, but slight scoring seemed to indicate that impurities had found their way into the lubricating oil in the crankcase. Pistons of Nos. 2, 3, and 4 cylinders were in good condition, but the top ring of No. 1 piston was seizing and the top rings of Nos. 5 and 6 pistons were gummed up, but there was no indication that any ring had been blowing. The liners generally were quite satisfactory, with slight scoring on the lower part and a maximum oval wear of 0·1 mm. Heads and pistons showed no abnormal signs of carbonisation and the valves and their seats had stood up to their tests well. The crank and camshafts, timing gears, water and oil pumps, and injection nozzles also were in a satisfactory state after 84 hr. running within a period of 107 hr.

The balancing and weight differences of the six sets of moving parts were checked carefully and gave the results indicated in the table at the bottom of this page.

Although only one of these double-engine 300 b.h.p. railcars is in regular service at the moment, the construction of five more is well under way, but completion will await observations on the behaviour of the first car, so that the remaining vehicles will be able to give full satisfaction from the beginning. An interesting comparison will be possible between these AEK cars and the standard Renault car with one 265 b.h.p. engine, a power which has just been increased to 300 b.h.p. by the modifications briefly mentioned earlier in this article.



Driving position of 300 b.h.p. Renault AEK car

FUEL CONSUMPTION OF 150 B.H.P. RENAULT ENGINE AT DIFFERENT SPEEDS AND LOADS

R.P.M.	B.H.P.	Fuel Consumption Gr. per b.h.p. hr.
1,500	150	174
1,400	141	173
1,300	131	173
1,200	121	172
1,100	111	173·5
1,000	101	175
900	91	176·5

FUEL CONSUMPTION, 150 B.H.P. RENAULT ENGINE

R.P.M.	B.H.P.	Fuel Consumption Gr. per b.h.p. hr.
1,500	150	174
	112·5	184·5
	75	206
1,300	37·5	350
	131	173
	97·5	188
1,100	65	210
	32·5	284
	111	173·5
900	82·5	185
	55	203
	27·5	266
	91	176·5
	67·5	190
	45	210
	22·5	268

WEIGHTS OF MOVING PARTS, RENAULT 150 B.H.P. ENGINE

No. of cylinder set	1	2	3	4	5	6
WEIGHTS, IN KILOGRAMMES						
Connecting rods—						
Big end	2·616	2·611	2·615	2·618	2·617	2·618
Little end	1·277	1·275	1·277	1·276	1·275	1·274
Pistons...	5·625	5·625	5·257	5·260	5·257	5·258

TESTS OF 150 B.H.P. RENAULT ENGINE

Hour	Speed, r.p.m.	B.h.p.	Fuel Consumption		Temperatures, °C.					Lub. oil press., kg./cm. ²	Remarks
			Density of Fuel	Gr. per b.h.p.-hr.	Water		Lub. oil	Exhaust	Air		
					Inlet	Outlet					
0	1,500	150									
1	1,500	150									
2	1,500	150	856	177	35	73	84	410	17	2.2	Oil at starting 24.35 kg.
3	1,500	150	856	177	53	71	86	415	19	2.2	
5	1,500	150	856	177	54	72	87	410	20	2.2	
7	1,500	150	856	177	53	71	85	410	22	2.2	
8	1,500	150	856	177	53	71	85	405	22	2.3	
9	1,500	150	856	177	53	71	85	408	23	2.3	3 kg. of oil added
11	1,500	150	854	178	53	71	85	410	23.5	2.3	
13	1,500	150	855	176.5	53	71	82	410	20	2.3	
15	1,500	150	855	176.5	52	70	82	400	19	2.3	
17	1,500	150	855	176.5	53	71	82	400	17	2.3	
19	1,500	150	855	176.5	52	70	82	395	16.2	2.3	3 kg. of oil added
21	1,500	150	855	176.5	53	71	82	395	15.5	2.3	
23	1,500	150	856	175.5	52	70	81	400	15	2.3	
24	1,500	150	856	175.5	53	71	79	400	14.5	2.3	
26	1,500	150	856	175.5	53	71	82	400	13	2.3	
28	1,500	150	856	175.5	52	70	82	400	18	2.3	3 kg. of oil added
30	1,500	150	856	175.5	53	71	83	395	21	2.3	
32	1,500	150	852	175.5	52	70	83	405	21.8	2.5	
34	1,500	150	855	175.5	51	70	82	400	20	2.5	
36	1,500	150	855	174	52	70	82	400	20	2.5	
38	1,500	150	855	176	52	71	81	405	17.5	2.4	3 kg. of oil added
40	1,500	150	857	175.5	52	70	82	400	17	2.4	
42	1,500	150	857	175.5	52	70	82	405	16	2.4	
43	1,500	150	857	175.5	52	70	81	400	15.5	2.4	
45	1,500	150	857	176.5	54	71	81	400	17	2.4	
47	1,500	150	857	175.5	53	71	81	400	18	2.4	3 kg. of oil added
49	1,500	150	857	175.5	52	70	81	400	18	2.4	
51	1,500	150	857	175.5	52	70	82	400	19	2.4	
53	1,500	150	853	173.5	52	69	81	400	21	2.4	
54	1,500	150	853	175	52	70	82	400	21	2.4	
56	1,500	150	853	173.5	52	69	81	400	21	2.4	
58	1,500	150	853	173.5	52	69	81	400	21	2.4	
60	1,500	150	853	173.5	52	69	81	400	21	2.4	

GAP OF 11½ Hr.

1	1,500	150	857	175.5	54	71	80.5	400	19	2.4	
2	1,500	150	857	174.5	52	70	82	400	20	2.4	
4	1,500	150	857	174.3	53	71	81	400	21	2.4	
6	1,500	150	855	174	52	72	82	400	23.5	2.35	
8	1,500	150	852	173	52	69	80	400	24	2.4	
10	1,500	150	852	173	52	69	81	400	23.7	2.4	
12	1,500	150	852	173	52	69	81	400	23.7	2.4	

OVERLOAD AND OVERSPEED TESTS (after gap of 5 min. from conclusion of about 72 hr. test)

12-05	1,500	165									
13-05	1,500	165	853	173.5	53	72	83	440	23	2.3	10 per cent. overload
13-10	1,650	150									
13-25	1,650	150	853	179.5	53	70	88	395	23	2.3	10 per cent. overspeed

FRACTIONAL LOAD TESTS (after gap of 10½ hr. from conclusion of overspeed test)

0	1,500	150									
1	1,500	150	856	174	51	69	79	395	17	2.4	Normal full load
2	1,500	150	856	174	52	70	80	395	18	2.4	
2	1,500	135									
3	1,500	135	856	177.5	52	69	81	365	19	2.4	0.9 load
4	1,500	135	856	177.5	51	67	80	365	20	2.4	
4	1,500	112.5									
5	1,500	112.5	854	184.5	53	68	80	330	21	2.4	0.75 load
6	1,500	112.5	854	184.5	54	68	80	320	21	2.4	
6	1,500	75									
7	1,500	75	854	206	58	70	82	265	24	2.4	0.5 load
8	1,500	75	854	206	58	69	81	265	24	2.4	
8	1,500	15									
9	1,500	15	854	512	55	62	78	150	23	2.4	0.1 load
10	1,500	15	854	512	61	69	81	155	22	2.4	

THESE TESTS WERE FOLLOWED IMMEDIATELY BY 30 MIN. IDLING AT 500 R.P.M., THEN BY 10 MIN. AT FULL LOAD AND SPEED AND A FURTHER 10 MIN. IDLING AT 500 R.P.M.

REMOTE CONTROL FOR MECHANICAL TRANSMISSION

A successful electro-pneumatic system

FOR the operation from a position away from the engine of a railcar running alone, or for the control of two mechanically-driven cars coupled in multiple-unit, an electro-pneumatic system for the regulation of the fuel control and the changing of the gears has been evolved by Ganz & Co., of Budapest. It has been applied to numerous cars in Hungary, Egypt, Argentina and elsewhere.

Referring to Fig. 1, it will be seen that the fuel control, gear-changing, and reversing are effected from each driving position by means of a single controller. The reversing and gear changes are operated simultaneously for all power sets by a single lever.

Pneumatic Operation of Gear Changes

By means of special levers it is possible to put any engine in gear or out of gear. The control of fuel admission is effected for the motive-power units actually in gear at any moment by a special common control lever. In addition, the engine of each railcar can in case of emergency also be operated directly by a mechanical system of rods from the driving position of its own car.

The engagement of each speed, as well as that of the direction of travel, is effected by operating compressed-air cylinders. The admission of compressed air to these cylinders is through auxiliary valves operated by means of electric relays, which may be supplied with current, or the current cut out, from the controllers; in the latter case they are drawn back into their rest position by springs. If these relays are brought into circuit the opening of the auxiliary valves permits compressed air to enter the corresponding servo-motor cylinder, whereby the desired speed or the desired direction of travel is engaged.

In the rest position, *i.e.*, when the current has been cut off from the relays, the corresponding servo-motor cylinder is evacuated through the auxiliary valve, enabling the corresponding coupling to be released. Suitable interlocks ensure that in each case it is possible only to operate the corresponding cylinders of the change-speed gear, and the control gear is arranged in such a manner that in the case

of each control manoeuvre the same procedure takes place in each motive unit simultaneously.

The control of fuel admission to the engine has been so arranged that a compressed-air servo-motor subject to the influence of a calibrated spring acts on the fuel lever of the engine. It is effected by two cylinders per engine operated by compressed air; the filling and evacuation of the cylinders is effected by means of pneumatic or electro-pneumatic valves connected with the driver's handles for fuel control or speed-changing in such a manner as to ensure the simultaneous operation, without any time lag, of engines situated at a considerable distance (up to 200 ft.) from each other.

As soon as the fuel control lever *T*, Fig. 2, is placed in the starting position, the cylinder *Ii* is filled in a fraction of a second by the aid of contact *C* and of the electro-pneumatic valve *a*, the action of which draws the fuel control lever *E* from the position *O* to the position *i*, corresponding to the other extreme position of the piston. This movement is effected via the forked connecting rod. Contact *C* keeps the valves *a* in circuit from the fuel control lever positions *Ii* to *Iv*; during this time the valves are supplying compressed air the cylinders *I*, the pistons of which, being in the field between *Ii* and *Iv*, permanently assure as a minimum the amount of fuel admission corresponding to position *i*.

The evacuation of the air cylinders *I* takes place when the lever *T* is between its positions *Ii* and *C*, and when this is done, contact *C* interrupts the current, and valves *a* connect the air cylinders *I* with the atmosphere. These cylinders then allow the lever *E* to return into the position corresponding to *O* fuel admission. The position *i*, adjusted by the cylinder of the lever *E*, has been chosen so that the engine will run at a speed of about 800 r.p.m., *i.e.*, at the speed required when making a gear change.

The air cylinders *II* serve for fine control and for the adjustment of degrees of fuel admission above 60 per cent. They receive the compressed air through the pressure regulating valve of the membrane type from a balancing pipe line, and supply the degree of fuel admission corre-

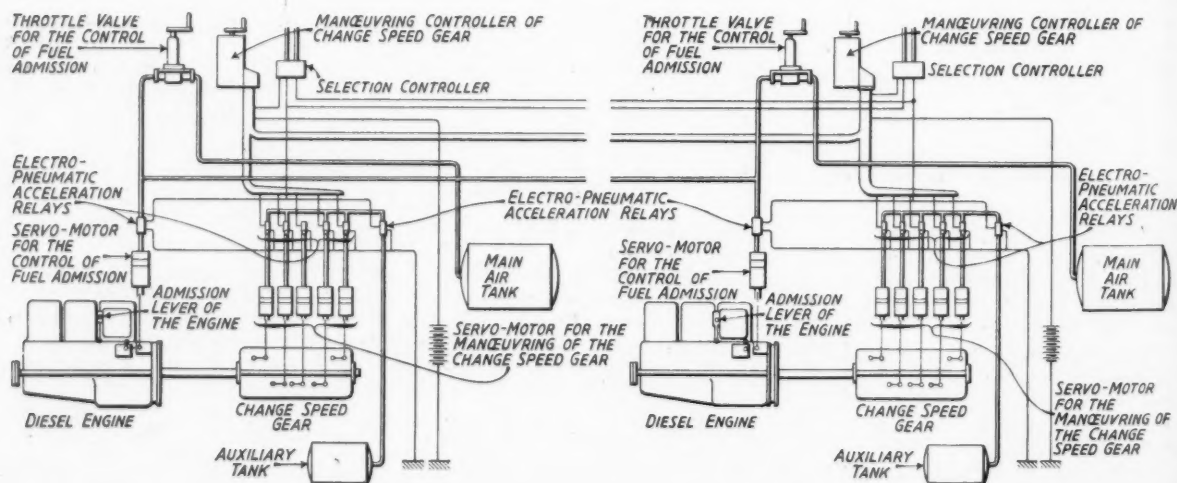
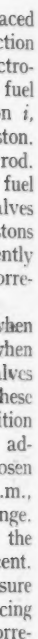


Fig. 1—Diagram of connections for Ganz electro-pneumatic remote-control equipment for diesel-mechanical railcars



ION

D

2F

5

XUM

but there are also provided on each driver's dashboard special checking instruments for each unit of equipment. Accordingly it is possible to control from each driving position the engine speed, temperature of the cooling water, oil pressure, and pressure of the compressed air for each unit of mechanical equipment.

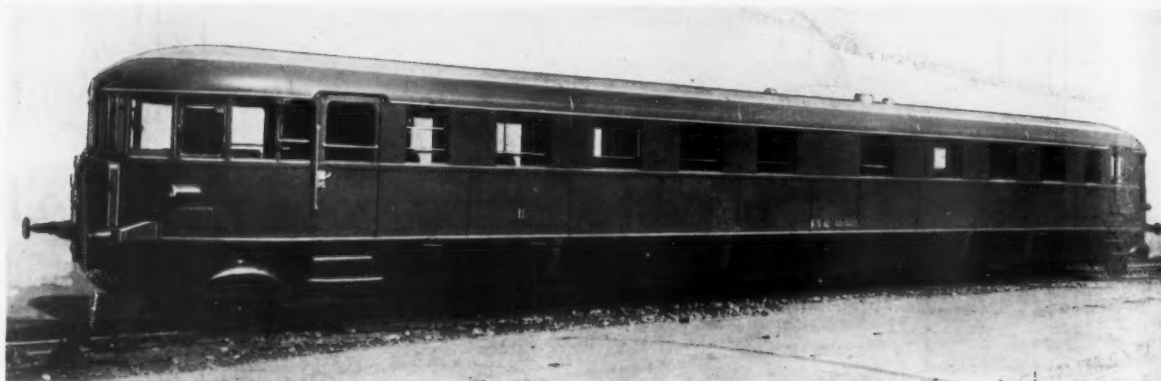
Automatic couplers with multi-cable connections and flexible hoses have been provided in order to carry the necessary connections from car to car in a simple and reliable manner.

SOUTH INDIAN DIESELS.—The board of the South Indian Railway has sanctioned the acquisition of eight broad gauge and four metre-gauge diesel railcars. This company recently has rebuilt some of its ordinary carriages with petrol engines and also rebuilt one of its petrol cars with a diesel engine, as described in the issue of this Supplement for April 17.

ZEPHYR ALTERATIONS.—One of the four-car 660 b.h.p. Twin Zephyr diesel-electric trains maintaining the 66 m.p.h. service over the 431 miles between Chicago and the Twin Cities has been transferred to a 59 m.p.h. service over the 247 miles from Dallas to Houston, Tex. The Twin Cities service is now being maintained by one Zephyr and one steam train, but at the end of the year the working is to be taken over by two new seven-car Zephyr trains now building at the Budd works, as intimated in our issue of October 2.

SOUTH AMERICAN DIESELS.—According to the speech made by Sir Follet Holt at the annual meeting of the Buenos Ayres Great Southern Railway, that company and its associates, the Buenos Ayres Western and Buenos Ayres Midland Railways, have on order 17 diesel railcars and four diesel locomotives. (See issues of this Supplement for August 7, September 4, and October 2.) The B.A.G.S. Railway is associated with the Argentine Government and another railway in the control of certain fuel supplies which enables the partners to obtain fuel at a low price and a relatively constant price.

EXPRESS BUFFET CARS FOR ITALY

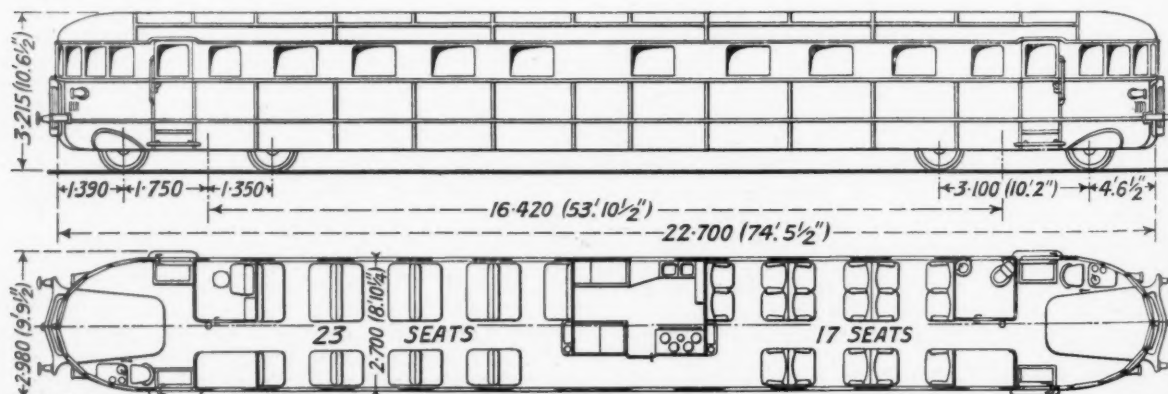
Double-engine design for main lines*Fiat buffet car running on the Italian State Railways*

FOR the past two or three months certain express train services in northern Italy have been worked by the new oil-engined buffet cars of the Italian State Railways, 25 of which have been built by the Fiat works at Turin. The routes now covered by these services are Milan—Venice; Milan—Bologna; Bologna—Verona; Venice—Bolzano; and they are to be introduced on the Sicilian and Rome—Ancona lines. In the mechanical details of body and frame, engine, and transmission, these vehicles are similar to the standard Fiat Littorina railcars, but the arrangement and finish of the interior are on super-comfortable lines, and there are the following differences: two 145 b.h.p. Fiat engines per car instead of two at 80 or 115 b.h.p.; the body width is 4 in. greater than any previous car; the body is 10 in. longer than any earlier Littorina; and the maximum permissible speed is 10 m.p.h. higher than any previous oil-engined Fiat car.

The cars are first and second class composites with accommodation for 17 first and 23 second class passengers arranged in two saloons. It will be noticed from the floor plan reproduced with this article that no attempt has been made to separate the two driving positions and engine rooms from the adjacent saloons, but the engines are mounted on the bogies through rubber blocks and

great attention has been paid to the efficient noise and heat insulation of the casings covering the engines. The two saloons are connected by a side corridor running alongside the kitchen, which has a gas cooking plant. Lavatory accommodation is provided and there are small mail cupboards and luggage racks at the ends of the saloons. Detachable tables are stocked for erecting between the seats as the passengers require. The floor is covered in thick linoleum, and the inner side panels, of aluminium, have a heat and noise insulating lining. Forced ventilation is incorporated and the windows are not made to open.

As is usual in present-day light-weight railcar practice there is no separate body and underframe. The framing is one complete structure of tubular girder shape, made up of alloy-steel sections completely welded up. As trailers are not hauled, only light emergency drawgear is required, and instead of two inside longitudinals only one is provided, down the centre; the side portions of the framing are tied to it by rigid floor plates and by cross braces to the lower part where they support the turned-in side panels. The alloy steel roof sticks carry a roof plate of aluminium and the floor plates are of corrugated aluminium. In contradistinction to many other light-

*Diagram of 290 b.h.p. oil-engined Littorinas for solo work*

Die
weigh
and
stitu
The
Littor
elim
the s
speed
each
has
struc
The
whee
betw
beari
tuck
auxil
The
also
react
carb
The
with
drum
to th
gear
Bo
engin
by 6
b.h.p
ing r
weigh
of th
Fr
clut
imme
pivot
clut
is ef
clut
The
tubul
then
paral
top g
box,
91-92

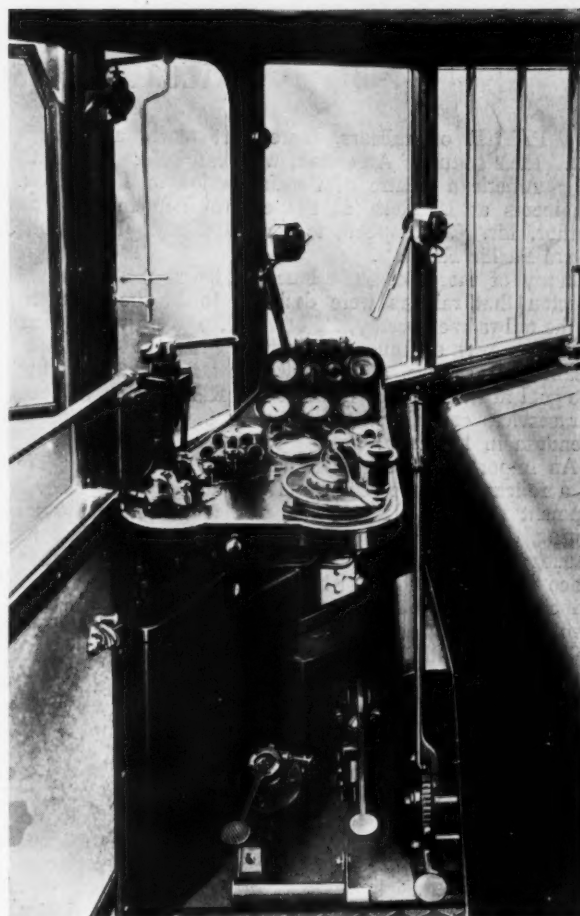
saloo
of ve
Fiat
servi

weight railcars there are no main members of the framing, and an endeavour has been made to make every constituent take an equal share in the stress distribution.

The design of the double-suspension bogies for the Littorina cars was studied very carefully in order to eliminate as much weight as possible without impairing the strength, and complete with 145 b.h.p. engine, four-speed mechanical transmission, attached brake gear, &c., each bogie weighs only 6.25 tonnes. Electric welding has been used in the fabrication of the bogie frame structure, but not to such a great extent as in the body. The main longitudinals are of steel channels, inside the wheels, and each has a shorter auxiliary channel outside between the front and rear wheels. Above each roller-bearing axlebox rests one end of a laminated spring; the buckle of this spring is supported between the main and auxiliary channels, and the inner ends rest on steel pads. The centre transverse member carrying the bogie centre also carries, through helical cushioning springs, the torque reaction from the axle drive. The disc wheels are of carbon steel and are forced on to nickel-chrome steel axles. The brakes are of the hydraulically-controlled air type with internally-expanding bands acting on the inside of drums attached to the wheels. The compressor is secured to the outside of the gearbox and is driven from one of the gear shafts.

Both engine and transmission are of the Fiat type. Each engine has six cylinders 125 mm. by 175 mm. (4.93 in. by 6.9 in) and develops a normal maximum output of 145 b.h.p. at 1,700 r.p.m. Complete with auxiliaries (starting motor, dynamo, Bosch fuel pump, &c.), the engine weighs 3,000 lb.; it is mounted on the main longitudinals of the bogie frame.

From the engine the drive is led through a friction clutch to a four-speed gearbox, both of which are situated immediately behind the engine and in front of the bogie pivot, which is not in the centre of the wheelbase. The clutch is of the multi-plate friction type. Gear-changing is effected by means of compressed air operating dog clutches for each set of gears on the secondary shaft. The drive is led to the inner axle of the bogie through a tubular cardan shaft with flexible couplings to a free-wheel, then to the usual reversing bevels, and finally through two parallel sets of helical gearing on to the axle itself. On top gear, that is with a straight through drive in the gearbox, the mechanical efficiency of the transmission is about 91-92 per cent., and on other gear steps about 87 per cent.



One of the two driving positions of the express oil-engined Littorina cars

These new buffet cars have a tare weight of 28.0 tonnes; the supplies weigh 1.5 tonnes; and the total weight with a full complement of passengers is 32.5 tonnes. The maximum speed is 130 km.p.h. (81 m.p.h.).



Interior of second class saloon, looking towards centre of vehicle, in the new 290 b.h.p. Fiat diesel railcars with buffet service, Italian State Railways

RAILCARS IN SOUTH AMERICA

A PAPER on railcars, more particularly as regards their status in Argentina, was read before the South American Centre of the Institution of Locomotive Engineers at Mendoza at the end of September. The author, Mr. J. Campbell, is connected with the Buenos Ayres Pacific Railway.

Many of those present seemed to be of the confirmed opinion that railcars were designed to be the salvation of the railways especially, for branch line work, where their operation was so much less costly than the equivalent steam train service, although it was also mentioned that the goal of the Buenos Ayres Pacific Railway was to have car services covering the distance from Buenos Aires to Mendoza in 13 hours!

An important aspect dealt with was the economic life of a railcar, and the author stated that the rate of development of the railcar engine and transmission system during the last five years could only be described as phenomenal and could be considered as having taken place side by side with the development of the railcar principle. Now that the latter had become more or less firmly established in certain countries, one might reasonably anticipate that the rate of development might slow down somewhat during what might be called the testing period and that, therefore, the railcar engine and transmission of today could be estimated at having a useful life of $7\frac{1}{2}$ to 10 years with a possible rejuvenation at the end of that period which would make the total life of the car structure a maximum of 15 years. This should not be taken as inferring that the railcar engine and transmission would be worn out in that period, but that progress and development might be such as to make it economic to consider replacement.

To budget only for a life of 15 years would, no doubt, sound absolute heresy to the person who thought of depreciation of railway rolling stock at the rate of $2\frac{1}{2}$ or 3 per cent. per annum, but considering that we were at the birth of a completely new conception of railway working the figure given above was not unreasonable.

The author brought up the question of preventive maintenance, on the principle of paying the doctor to keep one well as applied to overhauls and repairs for railcars. He discussed also the possibility of operating on fast schedules, which, with modern accelerative powers and braking, would permit stops to be made between stations to pick up and set down passengers without any increase in schedule timings. Acceleration was one of the angles given special consideration and much space was devoted to engine power. Modern ideas for streamlining, engine rating, mechanical efficiency, braking, and stability were also covered.

It was essential in all features of railcar operation to guard against that state of mind which considers that the railcar, being a departure from accepted standards, must necessarily be complicated and that because it was new it was bound to be troublesome, which was the essence of bad conservatism, and not at all in keeping with the spirit of progress.

Twenty-five speakers took part in the discussion. Mr. F. A. Bottomley, a director of the local board of the Entre Rios Railway, mentioned that the Entre Rios was eliminating all steam locomotives and replacing them with diesels. Mr. R. W. Walker, of the Associated Equipment Company, made suggestions in regard to streamlining. He thought it advisable to design railcars to last five or seven years, in preference to a longer period, so as

to be able to take full advantage of any development in the interim.

Answering several speakers regarding the operating costs of the B.A.P. railcars, Mr. Campbell gave comparative figures showing that they were operating at 27.4 cents per km. against \$1.13 on the equivalent steam train service. Another railcar was running at 24 cents, against \$1.05 per km. for equivalent steam service. This latter railcar had covered nearly half a million km. during the last three years. Mr. Campbell pointed out that the figures he was quoting were the result of operations over a three-year period, while those given by one of his critics covered only a three-months period.

Observation Diesel in Germany

For tourist purposes in the Rhineland district the Reichsbahn has acquired a diesel railcar in which the windows extend right round the car and in which the roof rolls back in the manner of a sunshine coach on the roads. To



give the passengers a still clearer view, by bringing the seats close up to the ends, two horizontal oil engines of the Deutsche Werke Kiel type, as described in the issue of this Supplement for November 1, 1935, are fitted below the floor. Each develops 180 b.h.p. at 1,500 r.p.m. and drives through its own set of Voith partial-hydraulic transmission. Accommodation for 60 passengers is provided, and the fuel capacity is sufficient for 360 miles.

THE DUTCH DIESEL TRAINS

IN the issue of this Supplement of February 22, 1935, we published an article on the cause of the extensive failures which had occurred in 35 of the 40 Dutch diesel trains, this article being based on the statements made by the Netherlands Railways and by the various builders of the mechanical portions, engines and electrical transmission.

Since that time all these trains have been put back in service, after alterations, and are now covering 300 to 350 miles a day per train. After the first 20-odd trains had been returned to traffic, Mr. W. Hupkes, the Chief Mechanical Engineer of the Netherlands Railways, gave further information as reproduced below, and this should be read in conjunction with our article of February 22, 1935, which is modified in certain particulars by the investigations carried on after that date.

Mr. Hupkes' Latest Information

As stated in the paragraph (*Diesel Railway Traction Supplement*, February 22, 1935) showing the opinion of the Maybach works, it was thought at first that the difficulties encountered were mainly due to the following unfavourable conditions: engines overloaded at reduced speeds; fuel supply sometimes defective and irregular, and use of unsuitable lubricating oil. As regards engine overloading, it may be said that the information given by the Maybach works, *i.e.*, that at 800 r.p.m. the generators were capable of dealing with 200 b.h.p., is not correct; in service the power developed at that engine speed did not exceed 120 b.h.p.

The fuel supply equipment was altered, and a small feed tank installed under the roof of the engine room,

the fuel being still pumped into this tank by air pressure. After this alteration had been made, no more trouble was experienced.

As for the lubricating oil, this had been substituted for that formerly used, as recommended by Maybach, some difficulties encountered with the engines having been ascribed to the original oil. This alteration had been made with Maybach's approval. A third brand is now being used with quite satisfactory results.

It is true also that the pistons originally used have been replaced by others made of an alloy having a lower expansion coefficient. It should be noted, however, that during the first period after the original pistons were put into service, little trouble was met with them, a small oil-fired boiler having been fitted, which enabled the cooling water to be preheated to about 140° F. before starting the engines.

Shortly after the first failures occurred, it was found that the necessity of withdrawing the engines from traffic (after running from 19,000 to 22,000 miles), was due mainly to the main roller bearings being damaged and also, to a smaller extent, the big-end roller bearings.

Bearing Trouble

Extensive tests carried out subsequently on the test bench of the Maybach works at Friedrichshafen, have clearly shown that, as regards the trouble with the main roller bearings, the causes enumerated at the beginning of the article in question were of very little importance, the main cause being that the bearings were overloaded, the overload arising from the combined effect of the inertia forces, vibrations and combustion pressures. As a result of these tests, Maybach has fitted the crankshaft with counterweights.

The first two engines fitted with balanced crankshafts were put into service in September, 1935, and have now covered well over 62,000 miles, no difficulties having arisen. Two more balanced engines have covered about 50,000 miles, and two others over 40,000 miles.

On the whole, 23 three-car articulated trains, each equipped with two engines with balanced crankshafts, are now in regular service, and cover on the aggregate about 146,000 car-miles monthly. So far, no engine trouble has been reported. The average mileage now being covered daily by the trains is between 310 and 370.

Light inspections and running repairs are carried out every seventh day; cylinders, pistons and rings are inspected after about 37,000 miles have been covered. A general overhaul is not expected to become necessary before at least 62,000 miles have been run.

In service, the mean fuel consumption per engine is about 0.22 gal. per mile (including heating oil), and lubricating oil about 0.68 gal. per 100 miles.

Thanks to certain improvements effected as regards the fuel pumps and injection nozzles, the maximum combustion pressure and the rate of pressure rise, which formerly were fairly high, have now been decreased.

No alteration was made to the electrical power transmission, except that the lowest running position was done away with.

Up to now, the Stork-Ganz engines have not given any serious trouble, but with these engines, it has proved difficult to keep tight the packing between the cylinder and cylinder head, and the flexible portion of the piping connecting the engine with the lubricating oil cooler has broke fairly often.



Driving position of the three-car diesel-electric trains of the Netherlands Railways

HIGH-POWER SINGLE-UNIT CARS FOR MOUNTAIN SERVICE

New French design with electric transmission

DURING the course of the summer the P.L.M. Railway put into service on the Marseilles-Grenoble line the first of a series of nine very powerful single-unit railcars, the working of which was noted in the issue of this Supplement for August 7, p. 252. Some of these cars are to operate a direct service between Marseilles and Briançon. The Marseilles-Grenoble and Veynes-Briançon routes are of an arduous character and attain a height of 3,940 ft. at Briançon; there are numerous grades, culminating in a $12\frac{1}{2}$ -mile bank at 1 in 40 combined with

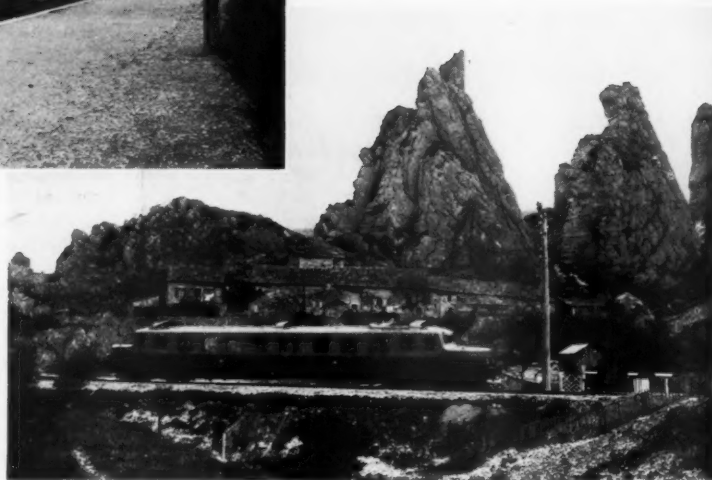
slipping. On test a speed of 85.8 m.p.h. has been attained, but in any case in normal service the cars would not exceed the legal 75 m.p.h.

Following the general railcar practice of the builder, Etablissements Decauville, the body framing is fabricated of chrome-molybdenum steel welded up, and the power units, mounted directly on the bogies, are covered by steel bonnets immediately behind which are the two driving positions. The main members of the framing are the two side beams, each of which is composed of a bottom



Above : 600 b.h.p. Decauville railcar, with Saurer engine and Oerlikon electric transmission drawing up at a station on one of the Alpine main lines of the P.L.M. Railway

Below : P.L.M. double-engined diesel-electric railcar en route from Grenoble to Marseilles along the foothills of the Savoy Alps



many curves of 820 ft. radius a short distance south of Grenoble, and during the winter heavy snowdrifts add to the operating difficulties.

Largely because of these conditions the motive power and transmission units are arranged to deliver full output at relatively low speed, resulting in extremely rapid acceleration when running alone, and providing a great drawbar pull for the haulage of trailers. The output per ton of gross car weight (including a full complement of passengers) when running solo is about 12 b.h.p., a figure which has proved sufficient to accelerate the car from rest to 56 m.p.h. on the level in 65 sec., and to haul a 25-ton trailer up 1 in 40 at a maintained speed of 34 m.p.h.

The normal top speed is 68 m.p.h. and this corresponds to the 100 per cent. speed indicated in Fig. 2. The maximum tractive effort is 9,700 lb., corresponding to the 100 per cent. tractive effort indicated in the same figure, and the adhesive factor is so high as to almost eliminate

member of heavy angle section and a top member of Z section joined together by vertical stringers. The two complete side members are connected together by the roof and by the floor framing. The framing of the bonnets and the ends of the car are built up as separate structures. Chrome-molybdenum steel is used for the outer panel plates and the roof plates, and these plates are arc-welded to their respective frame members. The inside panel plates are of aluminium and they are lined with a sound and heat insulating compound.

Welded steel plates and sections are used for the bogie frames and transverse members. The body is carried by a spherical pivot and two side bearers located on a rubber-supported bolster. Laminated springs support the S.K.F. roller bearing axleboxes, which are not provided with guides; the parallel alignment of the axles is maintained by four plates articulated to the bogie centre structure and carrying the axleboxes and the brake drums. Carbon

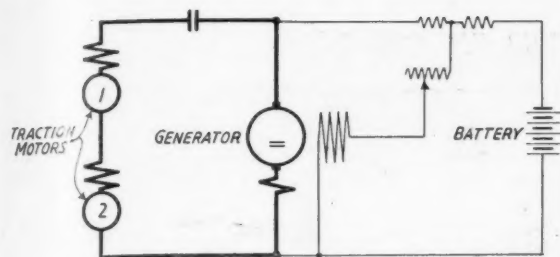


Fig. 1—Simplified diagram of Oerlikon control as used on P.L.M. 600 b.h.p. diesel-electric railcars

steel is used for the wheel tyres and nickel-chrome steel for the axles.

To cope with normal conditions on the steeply-graded Alpine lines, three braking systems are incorporated. The first is an air brake for normal use, and the cylinders actuate shoes on special brake drums attached to the wheels. The usual passengers' emergency brake is incorporated in this system, and automatic application of the trailer brakes, either for light special vehicles or ordinary stock, is controlled from the driving positions. The second brake is the ordinary hand type, and the third is another air brake producing a moderate retardation of the car and trailer when running down long grades and acting on ordinary brake shoes applied to the tyres.

Heating of the passenger saloon is effected by the engine exhaust gases, but electric radiators are placed beneath some of the seats and the car heated before starting by bringing into action one of the main generators.

Engine and Transmission

There are two 300 b.h.p. engines with direct-coupled generators, and each group is mounted on one bogie frame through the medium of rubber blocks. The engines are of the Saurer 12-cylinder BZD vee type running at 1,500 r.p.m. as described in detail in the issue of this Supplement for November 29, 1935. In addition to the engine-generator group each bogie is driven by two 125 b.h.p. nose-suspended traction motors, yet a bogie complete with all motive power and transmission equipment weighs only 10 tons.

The electrical transmission was designed and built by Oerlikon with a special view to lightness and simplicity, and a simplified diagram of the system adopted is shown

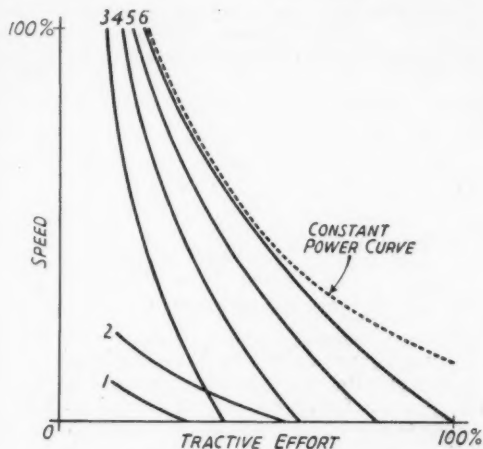


Fig. 2—Running characteristics given by Oerlikon electric control

in Fig. 1. The engine is controlled to work at three speeds, and the main generator is provided with shunt excitation and with separate excitation from the battery, through excitation resistances. The power characteristics obtained with this Oerlikon design are shown in Fig. 2. Each motor has a continuous rating at 2,730 r.p.m. (62 m.p.h.) of 240 amp. 420 volts, and a one-hour rating at 1,880 r.p.m. (42½ m.p.h.) of 310 amp. 325 volts. The drive from the motors to the wheels is through single reduction gears of the flexible type.

Each of the two controllers has two operating handles,

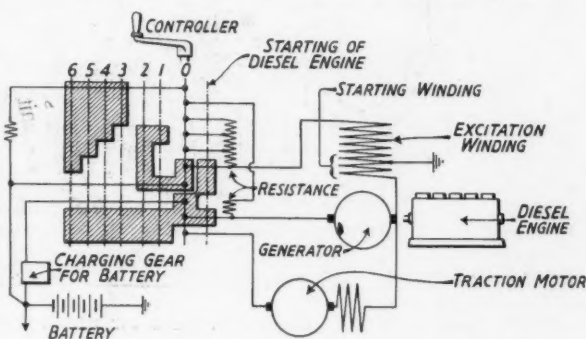


Fig. 3—Diagram of control; the auxiliary generator is not shown, the charging being effected directly off the main generator

viz., one for the direction of travel with the positions: reverse, off, forward, start engine No. 1, start engine No. 2, and electric heating; and the other for running, with positions: start, off, running 1-2-3 at 600 r.p.m., running 4-5-6 at 1,200 r.p.m., and running 7-8-9 at 1,500 r.p.m. At the driving position there are also two push-buttons for closing down the two power sets. Owing to the provision of combined shunt and battery excitation,

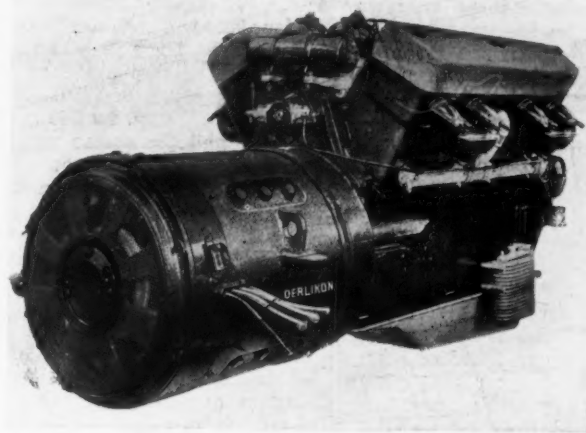
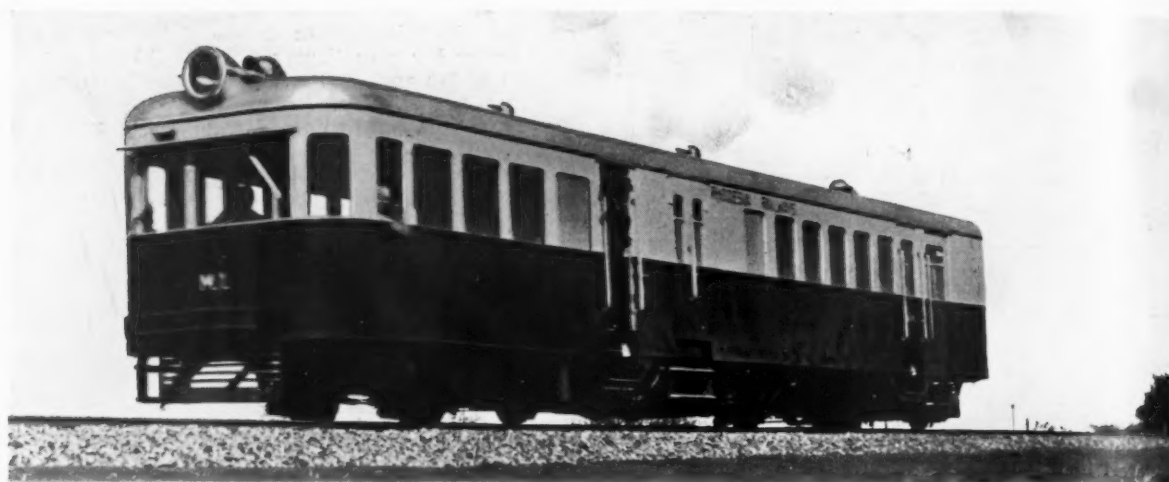


Fig. 4—Engine-generator group comprising 300 b.h.p. Saurer engine and Oerlikon main generator

there is strong excitation when starting, so that a good starting acceleration is obtained and automatic starting is possible without additional apparatus. There is a belt-driven auxiliary generator located in the vee between the two banks of cylinders of the engine and this charges the battery which furnishes lighting and starting current, but this is not indicated in Fig. 3, which shows an arrangement for charging from the main generator.

FIRST DIESEL RAILCAR IN RHODESIA



240 b.h.p. Ganz car running on the Shamva branch in Rhodesia

THE Rhodesia Railways have taken delivery recently of the first diesel railcar to operate on their system.

This car was built by Ganz, of Budapest, to the requirements of Mr. E. H. Gray, Chief Mechanical Engineer of the Rhodesia Railways, in collaboration with the Chief Superintendent of Transportation, and to the inspection of Sir Douglas Fox & Partners. It was acquired for experimental use as a means to provide more frequent and faster services on branch lines that have hitherto been operated with a twice or thrice-weekly steam train service, and to test the suitability of such a unit under Rhodesian conditions.

Running on the 3 ft. 6 in. gauge, the railcar is of the double-bogie type with a 240 b.h.p. six-cylinder Ganz-Jendrassik engine and a four-speed Ganz mechanical transmission mounted directly on one bogie in a manner similar to that used on the Egyptian cars described in the issue of this Supplement for September 6, 1935. The cylinders have a bore and stroke of 170 mm. by 240 mm. (6.7 in. by 9.5 in.) respectively, and the engine weighs between 20 and 21 lb. per b.h.p. The cylinders are cast in pairs and the blocks bolted to the one-piece aluminium-alloy crankcase. The cylinder heads also are cast in pairs and contain a pre-combustion chamber. Nickel-chrome-molybdenum steel is used for the six-throw seven-bearing crankshaft and light-metal for the pistons. Balance weights are secured to prolongations of the crankwebs. The transmission gives a top speed of 40 m.p.h. with an engine speed of 1,200 r.p.m.

The car body is of welded steel and has accommodation for 16 European and 40 native passengers, and has a baggage compartment large enough to take about 2½ tons of mail, miscellaneous parcels, cream cans, &c. Driving controls are fitted at each end, but normally the car operates with the European compartment leading; the driver is separated from this saloon by a glass partition which gives an excellent forward view to the passengers.

Comfortably upholstered bucket seats are arranged in pairs on either side of a centre gangway, and down each side are easily-adjustable drop windows. Opening off the entrance to the saloon is a lavatory, and next to it the luggage section and the native passenger compartment, with the engine room and a driving control room at the rear end of the car. Stone's electric lighting is provided,

special features being the powerful headlights and the small lights flush with the steps to assist passengers alighting or joining at night at sidings where there are no platforms. High-pitched motor horns are fitted for warning purposes and cowcatchers form part of the equipment. The car weighs 36 tons in full working order. Painted olive green to the waistline, with cream upper panels and an aluminium-coloured roof, it is quite distinctive from the usual varnished teak of Rhodesian coaching stock.

In addition to the actual power at the rail needed to drive the car, the engine is called upon to operate a compressor for supplying compressed air for the brakes, gear-changing, sanding, and sounding a signal horn, and to drive the auxiliary generator for charging the batteries, which in turn are required for furnishing current to the starting motors, the fan motors for the water-cooling system, the electric light system, and an additional signal horn.

The car has been placed in service on the Salisbury-Shamva branch line, where, working to a 3½-hr. timing for the 86½-mile journey including 19 intermediate stops, it is scheduled to perform the run 4 hr. faster than the mixed steam service, and in addition performs the round trip from Shamva to Salisbury and back daily, allowing passengers over 4 hr. in the capital city.

COTAL TRANSMISSION IN FRANCE.—The Cotal electromagnetic gearbox is now used in two 100 b.h.p. railcars on the P.O.-Midi system; four 100 b.h.p. cars on the P.L.M.; two 130 b.h.p. cars on the Est; two double-engine 300 b.h.p. railcars on the Nord; one 45 b.h.p. and two 240 b.h.p. diesel loco-tractors on the Nord; a 170 b.h.p. loco-tractor on the French State Railways; and on a number of the recent petrol-engined pneumatic-tyred Michelins.

ANOTHER DREWRY ORDER.—The Eagle Oil & Shipping Co. Ltd. has placed yet another repeat order with the Drewry Car Co. Ltd. for two 50 b.h.p. diesel locomotives with Gardner engines, Vulcan-Sinclair fluid couplings, and Wilson-Drewry epicyclic gearboxes. This order brings the total number of Drewry diesel locomotives in the service of the Eagle Oil Company to 23.